# THE LONDON NATURALIST

the journal of the
LONDON NATURAL HISTORY SOCIETY

No 63

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# LONDON NATURAL HISTORY SOCIETY

The Society welcomes new members, both beginners and experts. Its Area lies within a 20-mile (32 km) radius of St Paul's Cathedral and here most of its activities take place. Although much is covered with bricks and mortar, it is an exciting region with an astonishing variety of flora and fauna. The Society comprises sections whose meetings are open to all members without formality. For those interested in arachnology, archaeology, botany, conchology, conservation, ecology, entomology, geology, herpetology, mammalogy, ornithology, palaeontology or rambling, there is a section ready to help.

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*The London Naturalist,* published annually, contains papers on the natural history and archaeology of the London Area, including records of plants and animals.

The *London Bird Report,* published annually, contains the bird records for the London Area for each year, as well as papers on various aspects of ornithology.

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The Membership Secretary, P. C. Holland,
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*Leslie Baker, 1911-1983*

# LONDON NATURAL HISTORY SOCIETY

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# Contents

# Report of the Society for 1983*

The Society has had another successful year. Nineteen eighty-three saw the publication of the atlas of the *Flora of the London Area* by our previous President, Rodney Burton. This represents the culmination of many years of hard work and we are grateful to him and his helpers for such a successful product.

Elsewhere the Society has continued to be active. A Records Committee has been set up to consider how best the Society's records can be used and co-ordinated with those of other bodies. It is also hoped to continue to encourage recording by members of the Society. Co-operation with the London Wildlife Trust has continued and we hope that this can be extended. We are represented on the Trust's Council and have again made a grant towards the salary of their full-time Conservation Officer.

The programme is, as ever, full and varied. Attendances have been generally well maintained, except at a few indoor meetings. We thank all those who have arranged and led these meetings. The Bookham Common Survey has continued and the ornithological survey of Hounslow Heath has been completed. The Society is hoping to place tern rafts on a suitable area of water within the recording area to encourage these relatively uncommon birds to breed.

We enrolled 180 new members during the year, by far the best increase for some time. This was due mainly to the enterprise of our President, Keith Betton, in circulating our membership brochure to London members of the British Trust for Ornithology and in using other opportunities to bring our existence to the notice of people likely to be interested. Three deaths, 26 resignations and 123 cases of lapsing through non-payment resulted in a net increase of 29, compared with only three last year and substantial losses in the previous years.

The membership figures at 31 October 1983 are:

| | 1983 | *1982* |
|---|---|---|
| Ordinary | 900 | *877* |
| Affiliated | 22 | *22* |
| Family | 114 | *114* |
| Junior | 28 | *26* |
| Senior | 84 | *79* |
| Honorary | 16 | *17* |
| Life | 8 | *8* |
| Total | 1,172 | *1,143* |

This year, sadly, saw the death of Leslie Baker, one of our Honorary Vice-Presidents, who had been a member for thirty-five years. He will be particularly missed for his advice on publicity matters. He was primarily an ornithologist and his paintings and illustrations will be known by many members. The other deaths to be reported are those of Dr A. G. G. Thompson and W. D. Melluish, both members of long standing.

As always, our thanks go to Imperial College for the use of their rooms for committee meetings and to Mr Whitworth and his staff for custody of the Society's library.

*Presented at the Annual General Meeting, 13 December 1983.

# The Sites of Special Scientific Interest in London

by K. F. Betton*

**(Presidential Address delivered at the Annual General Meeting on 13 December 1983)**

In his Presidential Address in 1982 (*Lond. Nat.* No. 62), my predecessor, Rodney Burton, spoke about the functions of a local natural history society. He stressed that our Society must not forget that we are the *London* Natural History Society, and that we should concentrate our interests in the London area in addition to the rest of South-east England. He also stressed the importance of our Society as a recording body, co-ordinating the efforts of our members and others in the collection of data on a continuous basis. It was as a result of this Society's efforts that a list was produced several decades ago which was eventually used as the framework for the designation of Sites of Special Scientific Interest in the London area. It would be unfortunate if in the 1980s we gradually forgot the S.S.S.Is. and their importance in the conservation of natural history in our region. I hope that by identifying these sites I can stimulate some of you to visit them, hopefully recording what you find, and in future years your records will help to ensure that the value of these places is always known and understood. Due to the size of our recording area I am forced to concentrate on just those sites within Greater London, and I hope that another President may follow my move by discussing the other sites in a future address.

A Site of Special Scientific Interest is defined by the Nature Conservancy Council as 'any area of land which in the opinion of the N.C.C. is of special interest by reason of any of its fauna or flora or geographical or physiographical features'. S.S.S.Is. are certainly not the only places in Britain that are important for natural history, there are many others that need to be conserved too, but the S.S.S.Is. are the cream, and many are of both national and international importance. S.S.S.Is. are designated by the N.C.C. after considerable survey work to establish their flora and fauna in detail. In Greater London the focal point for such work is the Assistant Regional Officer, currently Douglas Kite. He can be contacted at the N.C.C's. headquarters at 19/20 Belgrave Square, London SW1X 8PY.**

Before a site is designated the N.C.C. gathers as much information as possible about the history of the locality, and either the Assistant Regional Officer or a contract worker will carry out surveys in the area. A number of factors are taken into account when a site is chosen. For example, the site is more viable if it is large and not fragmented. It should have a diversity of wildlife in a natural habitat. Ideally it should be a good representative of its kind within the region, and possibly of both local and national importance. It must be decided how fully the site represents this habitat, and whether it will need careful management to maintain its interest.

When the N.C.C. decides to designate a site it contacts each of the landowners or tenants giving three months notice of the official designation. The landowner will then be given a list of management suggestions to maintain the value of the site, and details of up to 28 damaging operations that would reduce the natural history interest of land. Such operations might be any of the following:

- cultivation of the land
- change of the grazing regime
- application of pesticides, fertilizers or manure
- dumping of rubbish and other materials
- burning of materials on the site

*36 Milton Road, Hampton, Middlesex TW12 2LJ.

**The N.C.C. is due to move out of London in the near future.

- introduction of feral animals (e.g. horses) and plants
- any kind of construction or destruction
- drainage, reclamation or extraction of minerals
- engineering, vehicle use or recreation
- management of game or wildfowl

These operations do not need planning permission, and so the action might have taken place without anyone knowing. In addition to informing the landowner, other bodies such as the L.N.H.S., the London Wildlife Trust, Thames Water, the local planning authority, the internal drainage board, etc., are notified as well.

When the landowner has been notified of the intention to designate the site, a period of three months passes during which the landowner can discuss management ideas with the N.C.C. Alternatively, he can plough up, drain or somehow destroy the natural history interest without breaking any laws. So it is at this point in the proceedings that a certain amount of goodwill is required between both parties, and I think we have all read newspaper cuttings giving details of cases where unhelpful landowners have taken such action. After the date of official designation, a landowner is required by law to give written notice of any planned damaging operations to the site and at least three months notice is required. During this period the N.C.C. must comment on the plans and suggest a management plan, or decide that the site is not worthy of protection. During the three months the landowner can take no action, and if he does there will probably be a fine of up to £500.* After the three months the N.C.C. may have agreed a management plan with the landowner in which the damage is minimised, or grants are paid to compensate the owner for agreeing to restrict or withdraw the damaging intentions. However, if no such agreement is reached, the N.C.C. can ask the Secretary of State for the Environment to issue a Nature Conservation Order which prevents the owner from taking any damaging action for a further nine months. If this Order is ignored, the owner can be fined up to £1,000 and an additional £100 per day if this is ignored. Finally, if no agreement is reached after the nine months the N.C.C. can either ask the Secretary of State to raise a Compulsory Purchase Order, or they can decide to dedesignate the site and allow the damaging operation to take place.

There are clearly several problems with this system at the present time. Apart from possibly destroying the site before designation has officially taken place, some landowners have been claiming compensation from the N.C.C. for not developing land which they had no intention of touching. The Government has also been criticised for not providing enough finance for the N.C.C. to carry out its duties satisfactorily, so that when sites are threatened there is not enough money to buy the land or even enter into an agreement with the owner. In addition to this, there has been much criticism of the fact that many statutory bodies, such as the Port of London Authority and the Department of Transport, do not need planning permission to carry out their work. For example, it has been estimated that 60 S.S.S.Is. are currently threatened by deemed planning consent of this kind.

Currently there about 4,000 S.S.S.Is. in Great Britain covering some 6% of the country. These include some 980 geological sites which are excellent examples of classic physiographical features. No such sites duplicate each other, and regular reviews take place as a result of more recent and better discoveries. For further information on the designation of S.S.S.Is. I would recommend the following publications: both are available free frm the N.C.C.:—*S.S.S.Is. — what you should know about Sites of Special Scientific Interest* (ISBN 0 86139 203 5), and *The selection of Sites of Special Scientific Interest — an explanatory paper* (ISBN 0 86139 219 1).

*Now raised to £1,000 (summer 1984).

Finally, I should explain that two sites in Greater London are designated as Local Nature Reserves. These are areas set up as reserves in conjunction with the local borough and associations such as the London Wildlife Trust. In such cases funding may be made available from local borough departments.

It should be remembered that there are no special rights of access to S.S.S.Is. or L.N.Rs. and many are privately owned. Below I give a rough outline of each site. More detailed information may be available via the N.C.C.'s Assistant Regional Office for London.

## WOODLAND

**Ruislip Woods** (TQ 087897) 878 acres Public access

An extremely important area of woodland with some heathland on the north-facing slope of the Colne Valley. The underlying soil is mainly London Clay with some exposure of Reading Beds. The woodlands are of oak with a hornbeam coppice which is regularly managed at Mad Bess Wood in particular. The site also includes Bayhurst Wood, Copse Wood and Park Wood, each of which has different attractions, in particular the fungal flora. At Northwood Golf Course there is an area of heathland with varied and interesting flora.

**Old Park Wood** (TQ 049913) 42 acres Public access long paths

This wood is on the west-facing slope of the Colne Valley. The soil is mainly calcareous, but is influenced by the overlying strata. This ancient wood consists mainly of oak with hazel, and there are several very interesting plant species. A section of the wood is managed as a reserve by the Hertfordshire & Middlesex Trust for Nature Conservation.

**High Elms** (TQ 445613) *ca.* 150 acres Public access

On the gentle north-facing slope of the Chalk of the North Downs near Orpington. Most of the area was formerly beech woodland, but has been modified by planting during the last hundred years. However, much of the original ground flora remains including several unusual species. In a few places there are open areas of chalk grassland.

**Epping Forest** (TQ 421890) 2,968 acres Public access

The Epping Forest S.S.S.I. is only partly in Greater London and was classed as a Grade 2 site within the recent Nature Conservation Review. This woodland was formerly much more extensive, being part of the Forest of Waltham. The vegetation includes oak, beech and hornbeam with an understorey including holly. There are also stretches of heathland with bracken, birch and thorn scrub, and some areas of damp grassland. Worthy of a visit is the Epping Forest Conservation Centre at High Beach.

**Croham Hurst** (TQ 338632) 85 acres Public access

This is an area of woodland on the steep ridge of Blackheath Pebble Beds overlying the Thanet Sands some 200 feet above the surrounding Chalk in this region. Generally the soil is well-drained and is covered with oak woodland and hazel/birch shrub layer. In places there are oaks growing out of the pebbles on very steep slopes indeed. Particularly there is a rich molluscan fauna including the rare snail *Pomatia elegans*. The area is being studied by the Croydon Natural History and Scientific Society.

**Devil's Den** (TQ 302570) *ca.* 70 acres Public access

Part of the main Farthing Downs S.S.S.I., the Devil's Den is an area of oak and beech woodland with an interesting flora including a number of locally uncommon plants of calcareous grassland.

**Hampstead Heath** (TQ 270870) 48 acres Public access

Only a small part of the Heath is designated, and it is that area consisting of Ken Wood and the sloping grassland to the south. Ken Wood lies mainly on the

Bagshot Sands overlying Claygate Beds and London Clay. It has typical woodland flora and a wide range of breeding birds. To the south of the woods is a *Sphagnum* bog (TQ 273268) which is sadly drying up due to the encroachment of trees in the immediate area. Geologically there are several interesting sites with an exposure of Bagshot Sands with cross-bedding and seams of clay at TQ 269875, evidence of spring sapping at TQ 259867, and Pebble Gravels at TQ 262867 between the Spaniards Road and North End Road.

**Stanmore and Harrow Weald Commons** (TQ 160940/TQ 140928) *ca.* 200 acres Public access

These areas lie on the cap of Pebble Gravel with a mixture of heathland vegetation and oak/beech woodland. Both areas have an interesting flora and a wide range of breeding birds. The Harrow Natural History Society has kept interesting records over the years.

**Crofton Heath** (TQ 437666) 55 acres Public access

Woodland on a flat area of London Clay with underlying Woolwich and Reading Beds. Most of the vegetation is oak with hazel coppice, and the woodland opens to small areas which were once arable. In particular the site has a wide range of Microlepidoptera.

**Perivale Wood** (TQ 160837) 25 acres Contact the Selborne Society for access

This wood is one of the oldest nature reserves in Britain, being formed in 1904 by the Selborne Society. It has a very well-recorded natural history with areas of hazel coppice under oak woodland, with many wild service trees. The area tends to be badly drained, although recently it has suddenly dried up. This is one of the two Local Nature Reserves in Greater London.

## HEATHLAND/SCRUB

**Barnes Common** (TQ 225759) 46 acres Public access

A flat common with scattered shallow excavations on well-drained sandy soils with acid grassland vegetation. Mainly there is scattered hawthorn, bracken and bramble. The ornithological interest is slight.

**Keston Common** (TQ 418642) 436 acres Public access

A large area of common land on the Blackheath Pebble Beds near Bromley, with parts dominated by heather, with gorse and birch. In the southern section there is an area of oak/beech woodland with holly. One very important feature is Keston Bog – a valley bog with exceptional botanical interest. In addition there are two large lakes with a rich flora and fauna.

**Rowley Green Common** (TQ 216961) 12 acres Public access

A very small area of relict heathland on Pebble Gravels overlying the London Clay with an acidic, light sandy soil. The heathland is now disappearing under oak and birch woodland due to the lack of grazing.

**Bentley Priory** (TQ 155925) *ca.* 120 acres Public access

An area of open neutral grassland grazed by cattle still on Claygate Beds and London Clay. The area has considerable growths of hawthorn and some gorse, with other areas of mixed deciduous woodland. A secluded lake at TQ 156927 is managed as a 9-acre reserve of the Hertfordshire & Middlesex Trust for Nature Conservation, created by the artificial impoundment of the Edgeware Brook. Contact the Trust for access details.

**Wimbledon Common** (TQ 225720) 845 acres Public access

A very large area of grass heathland and woodland on a plateau of River Gravels sloping down to the west through Claygate Beds and London Clay. In parts there has been a considerable invasion of birch and gorse. The main interest of the Common is made up by two small valley bogs with several uncommon

plants for the area. The woodland areas consist of oak/hornbeam/birch with much holly. The Common has a wide range of breeding birds which have been intensively studied in recent years, and also a wide range of butterflies and moths.

## WETLAND AREAS

**Barn Elms Reservoirs** (TQ 228770) 109 acres Access by permit from Thames Water

Constructed in 1897 to a depth of just 12 feet, these reservoirs are almost the oldest in Greater London. There are four reservoirs divided by grass-covered causeways, which are attractive as resting places for wildfowl, and in the 1960s they were considered to be the tenth best reservoirs for duck in England and Wales. However, since then the numbers have declined, and sadly the reservoirs have had their bankside vegetation cropped back. The reservoirs attract many gulls in winter at dusk, and up to 20,000 are regularly counted.

**Brent Reservoir** (TQ 217873) 177 acres Public access

Created in 1835 by the damming of the valley of the River Brent the 'Welsh Harp' as it is known, has natural banks with much waterside vegetation. The edges are shallow, particularly where the River Brent and the Silk Stream enter it, and here there are areas of silt. There are stretches of willow carr and reed, attractive to many species of birds, and water rail, grey heron and snipe are regular winter visitors. The Welsh Harp Conservation Group has launched many rafts which are nesting sites for both grebes and terns.

**Darlands Lake** (TQ 244934) 9 acres Access on application from Herts. & Middx. Trust

This small lake was formed by the damming of a stream and was formerly used as a duck decoy. A woodland ride through the reserve contains many interesting plants including fritillary *Fritillaria meleagris* which may be of dubious origin. The area is a reserve of the Hertfordshire & Middlesex Trust for Nature Conservation.

**Harefield Moor (Broadwater Gravel Pit)** (TQ 043899) *ca.* 300 acres Access by permit

When this site was designated in 1950 it was an area of damp alluvial grassland, but has since been excavated for gravel. At present there are several large lakes with islands for breeding birds, including herons. In winter the area supports a large population of wildfowl.

**Ruxley Gravel Pits** (TQ 474700) 44 acres Access by permit

A group of flooded gravel pits in the River Cray valley which are used as a balancing reservoir for the river. The pits are managed in conjunction with the Kent Trust for Nature Conservation and are currently threatened by the A20 reconstruction.

**Syon Park Marsh** (TQ 176766) 54 acres No access

This represents one of the few remaining areas of relatively unmodified river vegetation beside the River Thames in Greater London. There is a large reedbed and many willows and poplars with a few planted aliens. In June 1982 the rare snail *Perforatella rubiginosa* was discovered on the site (*Lond. Nat.* No. 62), and this together with the whole marsh is threatened by Thames Water's plans to control the flow of the river at various times of the year.

**Walthamstow Reservoirs** (TQ 352892) 433 acres Access by permit from Thames Water

These reservoirs were constructed between 1853 and 1897 and at the time large quantities of soil were heaped in the centre of the reservoirs, eventually to become bird sanctuaries. The islands were attractive because of their lack of disturbance and predators. In 1914 a heronry became established, and is currently

either the third or fourth largest in England and Wales, with about 125 pairs. Great crested grebes and several other waterfowl species breed.

**Ruislip Local Nature Reserve** (TQ 090899) 12 acres Access by permit from Herts. & Middx. Trust

This is a predominantly marshy area on alluvial soils where the Ruislip Common Brook enters Ruislip Lido. The marshland habitat includes reedbeds, willow carr and several man-made ponds. There is an area of bracken and heathland, with encroaching oak, birch and hawthorn. The reserve is managed by the Hertfordshire & Middlesex Trust for Nature Conservation with the Ruislip & District Natural History Society, and is a Local Nature Reserve.

**Frays Farm Meadows** (TQ 057861) 70 acres No access

One of the last remaining examples of relatively unimproved wet alluvial grassland in Greater London in an area which continues to be managed by grazing. In winter the meadows are flooded at times, and attract a range of wintering birds such as snipe and lapwing. At other times of the year the interest is mainly botanical with a range of plants that are declining in the London area.

## GRASSLAND/DOWNLAND

**Downe Bank** (TQ 438610) *ca.* 50 acres Access by permit from the Kent Trust for Nature Conservation

An area of woodland and chalk grassland on the western slope of a northward-running dry valley in the North Downs near Orpington. The main interest here is the grassland which has been subjected to encroachment by scrub. It was here that Charles Darwin did much of his studying, and another of the site's attractions are the orchids of which several species are found. The area is managed as a reserve by the Kent Trust for Nature Conservation.

**Farthing Downs** (TQ 302570) *ca.* 200 acreas Public access

An open area of rolling country on the Chalk with good chalk grassland and open hawthorn scrub with several interesting plant species. Currently the scrub is encroaching onto the grassland too much, and needs clearing.

**Coppermill Down** (TQ 043906) *ca.* 20 acres No access

This is actually part of the Harefield Moor S.S.S.I. but it seems more appropriate to list it separately. It is one of the last areas of chalk grassland in Middlesex and includes several interesting species of plants, including orchids. Currently the site is suffering from scrub encroachment.

**Riddlesdown** (TQ 327604) *ca.* 90 acres Public access

An extensive area of scrubland and grassland on a very steep south-west facing Chalk scarp. There is an interesting area of yew woodland with mixed calcareous scrub of considerable age.

## GEOLOGICAL SITES

If you wish to visit any of the following sites you should check first with the N.C.C. to see if access is possible. Obviously these sites can be dangerous and cannot be left open to the general public.

**Charlton Sand Pit** (TQ 419786) 10 acres

The best and most complete section of the Lower Tertiary sequence in the London area.

**Harefield Chalk Pit** (TQ 043899) *ca.* 10 acres

Contains a classic section in the London area showing the Chalk (Cretaceous) overlain by Tertiary strata. The top surface of the Chalk is an erosion surface associated with burrows thought to have been dug by crustaceans. The base of the

Tertiary sequence is a Beach Gravel and the overlying Reading Beds and London Clay contain many features of sedimentary and palaeontological interest.

**Lesnes Abbey Woods** (TQ 481786) 15 acres Public access

Blackheath Beds (Lower Eocene) with many gastropods, lamellibranchs and remains of mammals, reptiles and fishes.

**North End Pit** (TQ 515771) 1 acre

The last major exposure of the classic Crayford Brickearth, a deposit forming part of the Taplow Terrace Series of the London Basin dating from the last glaciation. The Crayford Brickearth has long been famous for mammalian and molluscan remains as well as Palaeolithic implements.

**Rock Pits** (TQ 423706) 1 acre

Pits in the highly fossiliferous phase of the Blackheath Beds (Eocene).

**Rose & Crown Chalk Pit/Kenley Station Chalk Pits** (TQ 337593) *ca.* 10 acres

The Rose & Crown Chalk Pit is the key exposure for much of the North Downs for the succession from the *lata* zone, Middle Chalk, to the *cor-angiunium* zone, Upper Chalk, which shows many features of high interest. Kenley Station Chalk Pit is an exposure of Upper Chalk of *planus* and *cor-testudinarium* zones showing the equivalent of the Top Rock of the Chilterns at zonal junction.

Currently the N.C.C. officers in the counties are busy renotifying S.S.S.Is. as a result of the Wildlife and Countryside Act, 1981, and their time is limited. However, several sites in Greater London are being considered for notification, and others will be notified formally in the next few months. They include:

Oxleas Woodlands (TQ 445757)
Cranham Marsh (TQ 572855)
Scadbury Park (TQ 457705) – possibly a Local Nature Reserve
Walthamstow Marshes (TQ 348879)
Hainault Forest (TQ 480930)

Hopefully the London Natural History Society can help the Nature Conservancy Council in its work by carrying out surveys on such sites to help speed up the process of notification, and it would please me greatly if our various sections included more S.S.S.Is. in our outings programme in future years as a result of this talk.

I should like to thank Douglas Kite and his predecessor Richard Findon at the N.C.C. for their valuable guidance and comments.

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# Book Review

*The Lost Rivers of London.* By N. J. Barton. Historical Publications Ltd, New Barnet. 1982. 148 pp. £7.50. ISBN 0 9503656 3 7.

As London Naturalists we must be curious about the tributaries of the Thames, such as the Fleet, which have long since disappeared from view. Were they crystal streams flowing gently through delightful countryside? Did they support an abundant flora and fauna? Were they enjoyed as an amenity by the local people? This book is subtitled 'A study of their effects upon London and Londoners, and the effects of London and Londoners upon them'. It tells us that in certain cases and at some times such streams were an asset to those living around them, but all too often they were (like the Thames itself) sources of disease and insupportable stench. The courses of some sixteen streams, now confined to pipes or conduits or part of London's complex sewer system, are described with much fascinating history of the localities through which they passed. The illustrations include one showing the massive pipe containing the Westbourne, which can be seen crossing the platforms at Sloane Square Underground Station, and a large fold-out street map with the rivers clearly marked. This slim volume, first published in 1962, is still the only comprehensive study of the topic and makes fascinating reading.

P. C. Holland

# Rail-like Cursorial Birds of the British Lower Eocene, with Descriptions of Two New Species

by C. J. O. HARRISON*

## Summary

Although bird bones from the Lower Eocene London Clay provide very good comparative material it is sometimes difficult to refer additional material to a species based on a single bone. *Pediorallus barbarae* Harrison and Walker 1977 was described from these deposits. Its hind-limbs are rail-like, but large and atypical, and it is now regarded as a possible member of an ancestral ratite group. It has distinctive characters justifying the assignment of additional specimens, and using seventeen specimens from different collectors the presence of three species of the genus is established. Two new species, the smaller *P. nasi* and still smaller *P. hookeri* are described.

## Introduction

I would like to begin by pointing out that the study has been of interest in that it demonstrates the contribution that amateurs can make to taxonomic studies, if they can accept the time-lag of years between the provision of specimens and the published evidence of their usefulness. Recent work on British fossil birds has relied heavily on the contribution made by fossil finders who have been willing to make their material available. In the present study use has been made of sixteen specimens presented by seventeen different collectors and originating from six different localities.

One bone came to the British Museum (Natural History) in the nineteenth century, but for more recent contributions I am most grateful to Messrs J. Adams, T. Bassett, N. Chapman, A. P. Currant, J. Cooper, B. Dean, A. Gale, B. Gasson, W. H. George, J. J. Hooker, A. Metcalfe, W. J. Quayle, M. F. Symonds, E. M. Venables, C. A. Walker and A. Wrigley, without whose efforts this work would not have been possible.

The London Clay deposits of the Lower Eocene have yielded a large number of bird bones. The specimens are particularly useful in that they emerge from the deposits usually free of matrix, uncrushed and retaining their original details of structure. However, some extremities and projections may be damaged (and with limb bones the more fragile hollow shafts may have snapped so that only half a bone is found) but the material is still of high quality.

The problem with this material is that associated bones are rarely found. Some more resistant nodules in the clay of the Isle of Sheppey in Kent have yielded a number of bones of a single individual, the best example being the seabird *Prophaethon shrubsolei* Andrews 1899 (Harrison and Walker 1976), and recent further specimens have been found by W. J. Quayle. In addition a very valuable collection of associated specimens has been made available by W. H. George and S. Vincent from deposits at Walton-on-the-Naze in Essex; but the vast majority of specimens are single bones, some incomplete.

The preservation of these specimens is such that it is possible to compare them directly with bones of Recent species, viewing them from all angles and assessing their likely affinities. It has been possible to assign a number of them to known or new families and to make them holotypes of new species. Thirty-five species are known from the British Lower Eocene (Harrison and Walker 1977, Harrison 1980, 1982 *a* & *b*), of which twenty-five have recently been described.

Where such identifications have been based on single bones difficulties arise when further specimens become available. It is likely that some at least are

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referable to the species already described. The most economical hypothesis is to recognise as few species as can be justified by the variation in the material available, and to refer additional specimens wherever possible. However in some instances, as in the phasianid gamebirds of the Lower Eocene, the relative similarity in size between some of the described species may make it impossible to do more than assign a new specimen to the group rather than to one particular species.

In other cases the distinctive characters of species and their variation in size, make it possible to bring together some of these scattered bone fragments and to begin to build up a more complete picture of the species concerned. This has been feasible for *Pediorallus* of the British Lower Eocene. Once the characters of the bones of one species were recognised it was possible to assemble material that indicated the existence of further species, and provided more information about them.

## Discussion

Rails, Rallidae, form a significant part of the Tertiary bird fauna (Cracraft 1973, Olson 1977) but although the British Middle Eocene avifauna of seven described species (Harrison and Walker 1979, Harrison 1982*b*) has no less than three, no typical ones were identified among the thirty-five birds of the Lower Eocene fauna, and the large and atypical *Pediorallus barbarae* was assigned to this family with allowance being made for a possibly more generalised structure.

Material newly available indicates the existance of three small typical rails in the Lower Eocene (Harrison 1984). Further *Pediorallus* material shows that as a rail it would be atypical in lacking the lateral compression to the ends of limb bones, in having legs more like those of cursorial birds and in lacking a tendinal bridge on the tibiotarsus. Study of more complete material including skulls from similar deposits in western North American by Peter Houde (pers. comm.) have shown that these anomalies are explained by its real affinity to a previously unknown family of medium-sized birds with palaeognathous palates and powers of flight (Houde and Olson 1981) that may have been ancestral to our modern ratites such as tinamous, kiwis and cassowaries. The family name is not available until Houde's publication appears, but it represents yet another taxon present in this early British material. Since *Pediorallus* was originally studied as an aberrant rail, species of Rallidae have been used in some instances for comparison.

The earliest specimen assigned to *Pediorallus barbarae* Harrison and Walker 1977 was a left tarsometatarsus, the lower leg bone, lacking two of the three distal trochlea for the articulation of the toes. The specimen had been collected prior to 1891 in London near St James's Park, from the London Clay (Division C?). It was in the collection of W. J. L. Abbott, and a cast of it at the british Museum (Natural History) became available when Lydekker (1891) was cataloguing the museum's fossil birds.

The original specimen finally went to the Geological Survey Museum, now the Institute of Geological Sciences. In a note in the addenda to this catalogue Lydekker figured it, slightly inaccurately, and assigned it to an early heron *Proherodius oweni* which he had earlier described from a fossil sternum. The tarsometatarsus was not that of a heron. Nor, for that matter, was the sternum, which appears to be that of a species belonging to the Presbyornithidae (Harrison and Walker 1978) a family of long-legged, long-necked relatives of the waterfowl.

The tarsometatarsus was in good condition, but the projecting hypotarsus on the posterior side of the upper, proximal end was worn, and some details of the structure lost. The hypotarsus is a block of bone carrying grooves or closed canals for the leg tendons, and it often varies diagnostically from one bird family to another. Fortunately a second specimen was available. A proximal end of a right tarsometatarsus matching the first had been collected by J. Cooper in 1970 from the London Clay (Division C) in a pit at High Ongar, Essex. It had a more perfect

hypotarsus, a short solid structure with a shallow groove sited posteriorly on the lateral (external) side.

The second specimen was made the holotype on which *Pediorallus barbarae* was based, and the earlier specimen was used as an additional paratype. On the latter the distal end in the region of the trochleae for the toes, and the wider-sited cotyla hollows at the proximal end which articulate with the tibiotarsus, the upper leg bone, lacked the evidence of lateral compression which is typical of such bones in rails and were more suggestive of those of game-birds. This suggested that the bird might have inhabited drier and more open areas and had game-bird-like habits.

More recently two more proximal ends of tarsometatarsi have become available, a left collected by B. Gasson in 1977 and a right by A. Metcalfe in 1980. Both are from the Warden Point area of the Isle of Sheppey. This is London Clay Divisions D-E, and the specimens extend the time-range of the species into younger horizons. The bones are about 5% larger than the London and Ongar specimens at the proximal end and along the shaft.

In 1979 F. J. Quayle had collected the distal half of a left tibiotarsus from Sheppey. It was damaged and partly covered with matrix which masked some characters. It was provisionally identified as a bone of a rail about the size of a purple gallinule *Porphyrio porphyrio*. In 1981 M. F. Symonds collected a similar specimen from the same locality, almost undamaged (Fig. 1A-C, E-F). The significant characters were that the rounded condyles were widely set anteriorly; the medial (internal) condyle tilting medially towards its proximal end. The tendinal canal running along the anterior surface of the shaft (Fig. 1A) differed in position from that of rails in being sited close along the medial edge of the shaft.

In the vast majority of birds, including rails, the tendinal canal of the tibiotarsus has a bony supratendinal bridge spanning it at the distal end holding a tendon in place. This specimen and others of the genus later examined all lacked the bridge, although the points of attachment were apparent on either side of the canal. It would appear to be a character of the genus that the bridge is formed of cartilaginous, unossified material which does not persist in the fossils. Just proximal to the condyles, near the site where the supratendinal bridge would have been, there is a centrally-placed prominence, its upper surface damaged in Symonds's specimen.

When these tibiotarsi were experimentally fitted to the tarsometatarsus of *P. barbarae* they appeared to match it. The fit was so good that I was prepared to regard them as additional material of that species. As shown in figure 1, if the tibiotarsus 1F were referable to *P. barbarae,* then another but slightly smaller specimen 1D was probably also referable to this genus.

The latter was collected by W. H. George in 1977 from Walton-on-the-Naze. It is from Division A of the London Clay, representing the earliest of the material. It consists of a number of bone fragments, believed to be from a single individual. In addition to the distal end of a tibiotarsus there is the distal end of a femur, proximal end of an ulna, proximal tip of a humerus and two incomplete vertebrae.

In its structure the distal end of the tibiotarsus is very similar to that assigned to *P. barbarae;* and I have seen some undescribed material of *Pediorallus* which justifies the association of the distal femur of the Walton-on-the-Naze bird with the tersometatarsus on which *P. barbarae* is based. Since the tibiotarsus of the Walton species is associated with the femur and is similar to those tibiotarsi now tentatively referred to *P. barbarae*, this would justify the linking of these scattered specimens.

The tibiotarsus (Fig. 3) of the Walton bird, which I intend to name *Pediorallus nasi,* is similar in shape to that of *P. barbarae,* but a little smaller. It has the same tilted medial condyle and medially-sited tendinal canal. The supra-tendinal bridge is absent. The central prominence near the site of the bridge carries a distinct rounded anterior tubercle. The femur (Fig. 4) shows a rather narrow

rotular groove and an abruptly prominent lateral condyle. The distal end of an ulna (Fig. 5) shows the edge of the lateral condyle curving down smoothly to meet the shaft, without the palmar projection apparent in rails.

Small size is a character which helps to distinguish this species within the genus. A distal end of a left tibiotarsus collected by A. Wrigley at Sheppey is of similar size but very worn. It appears to indicate the probable persistence of this species into the younger horizons of the London Clay.

When *P. barbarae* was first described two distal ends of humeri differing in size were provisionally assigned to it. These have been re-examined. The wing bones are well-developed in *Pediorallus*, and the larger specimen (A4490) collected by A. Gale from the London Clay (Division B) of Herne Bay, Kent, in 1969, appears referable to *P. nasi*. As with other bones there are characters present reminiscent of both rails and game-birds.

Finally, in 1982 T. Bassett collected from Sheppey a second distal end of a femur of *P. nasi*, and a worn proximal end of a tarsometatarsus which from its size appears referable to that species and appears to fit the holotype distal end of a tibiotarsus. With parts of femora available further comparisons could be made and P. Houde has pointed out (pers. comm.) that the distal end of a right femur (A4270) originally tentatively referred to *Neptuniavis minor* Harrison and Walker 1977 also appears to be referable to *P. nasi*.

A distal end of a left tibiotarsus was collected from Warden Point, Sheppey, by J. J. Hooker in 1980. This matches in general shape the specimens assigned to *P. barbarae* and *P. nasi* but is considerably smaller than both. I propose to describe it as a new species, *P. hookeri*. There are three small proximal ends of tarsometatarsi, similar to those of *P. barbarae* in appearance but with the cotyla edges and hypotarsus too battered to make them suitable for type material. They appear referable to this genus and they fit the distal end of the tibiotarsus of *P. hookeri*, to which species I tentatively assign them. One is the end of a left tarsometatarsus collected by C. A. Walker in 1964 and previously overlooked, another collected by A. P. Currant in April 1973, and a third an end of a right tarsometatarsus collected by J. Adams in August 1977, all from Warden Point, Isle of Sheppey.

The smaller distal end of a left humerus, collected by E. M. Venables from the London Clay (Division B) of Bognor Regis, Sussex, and presented in 1963, is of a size to be expected of *P. hookeri* by comparison with the other, and I am therefore tentatively reassigning it to that species.

## Conclusions

By bringing together material from various sources it has been possible to establish that the genus *Pediorallus* of the Lower Eocene London Clay has three size categories, apparently discrete, and I conclude that three closely-related species are involved. The moderate-sized *P. nasi* occurs in the oldest horizon and is present from Division A at Walton-on-the-Naze to Divisions D-E at Sheppey. A slightly larger species *P. barbarae* is co-extant from Division C at Ongar to Division D-E at Sheppey. A small species, *P. hookeri* appears from undescribed material elsewhere to be present in the oldest horizon at Walton-on-the-Naze, in Division B at Bognor Regis and occurs with both the others in Divisions D-E at Sheppey.

The general structure as shown by these bones indicates a bird with a mainly terrestrial existence, but possessing reasonable powers of flight. Original comparisons were made with recent rails, and relative to these the ends of bones of *Pediorallus barbarae* are comparable in size with those of the larger Old World purple gallinule *Porphyrio porphyrio* but the bones themselves are shorter. In general appearance the bird was probably stouter and smaller than the latter species, more like the Recent common pheasant *Phasianus colchicus*. The bones of the smallest species, *P. hookeri*, are closer to those of the coot *Fulica atra* in size, but with thicker shafts indicating again a stouter and shorter bird.

## Taxonomic Descriptions

### Genus ***Pediorallus*** Harrison and Walker 1977

TYPE SPECIES *Pediorallus barbarae* Harrison and Walker 1977.

EMENDED DIAGNOSIS. Moderate-sized birds comparable with larger Recent game-birds and rails. Tarsometatarsus long, relatively stout, and anteroposteriorly flattened; anterior metatarsal groove broad and deep, continuing into broad outer extensor groove; trochlea for second digit showing some posterior and posterolateral deflection. Hypotarsus posteriorly prominent, small, proximodistally short and triangular in outline, with short, shallow tendinal groove on medial side bordering a stout flattened block in the middle. Tibiotarsus with shaft stout towards distal end, posteriorly and laterally rounded and anteriorly flattened; tendinal canal narrow, close to medial edge of shaft and at distal end curving medially towards base of medial condyle; supratendinal bridge absent; raised area on mid-shaft adjoining absent bridge with small prominent tubercle; distal end broad with condyles anteriorly divergent; lateral condyle short and broad; medial condyle longer and narrower with a medial slant; intercondylar fossa broad. In anterior view medial condyle slants posteromedially. Femur with rotular groove narrow; posterior intercondylar fossa with deep attachment scar, and both lateral and medial condyles prominently projecting and abruptly cut away at popliteal hollow. Proximal end of ulna with lateral edge of lateral condyle curving down smoothly to shaft without palmar projection.

### ***Pediorallus barbarae*** Harrison and Walker 1977
(Figs 1-2)

DIAGNOSIS. Larger than *P. nasi* and *P. hookeri*. Tibiotarsus with anteroposterior thickness of intercondylar groove relatively stout.

MATERIAL. Holotype a proximal end of a right tarsometatarsus (BMNH A3681) collected by J. Cooper in 1970. Paratype a left tarsometatarsus lacking the 3rd and 4th trochleae (IGS GSM 4805: cast BMNH A225) ? collected by W. J. L. Abbott prior to 1891. Tentatively referred specimens — a proximal end of a right tarsometatarsus (BMNH A5195) collected by A. Metcalfe in 1980; proximal end of a left tarsometatarsus (BMNH A5197) collected by B. Gasson in 1977; two distal ends of left tibiotarsi, (BMNH A5198) collected by W. J. Quayle in 1979 and (BMNH A5199) collected by M. F. Symonds in 1981.

OCCURRENCE. Divisions C-E, London Clay (Ypresian): Lower Eocene. Holotype tarsometatarsus (A3681) from Division C, Ongar, Essex; tarsometatarsus (4805) from Division C?, St James's Park, London; tarsometatarsi (A5195, A5196) and tibiotarsi (A5198-99) from Divisions D-E, Isle of Sheppey, Kent.

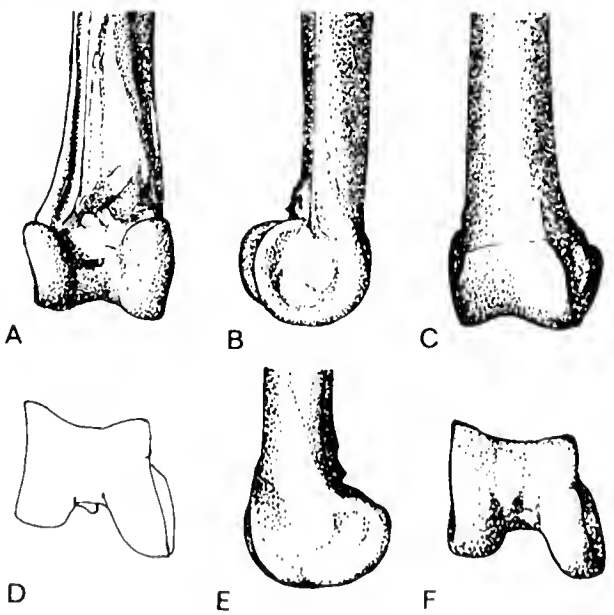


FIG. 1. *Pediorallus barbarae*. Tentatively referred distal end of left tibiotarsus, A5199. Views – A anterior, B lateral, C posterior, E medial, F distal. View D is distal end of holotype of *P. nasi*, A5200, for comparison.

COMMENTS. The additional material now available for this species consists of distal ends of tibiotarsi. Two specimens are available of which the more complete one is shown in figure 1. The angled, inclined and anteriorly-divergent condyles and narrow, unbridged tendinal groove near the medial edge of the shaft are significant characters. Since the raised area which would have carried a tubercle is damaged in one specimen and masked by pyritic accretions in the other it is not possible to be certain that it would be present. The size difference between this and *P. nasi* is not very great but the general structure is stouter as well as larger and the anteroposterior thickness of the intercondylar groove is also proportionally greater. This is apparent in figures 1F and D, and is not an aspect of size since that of *P. hookeri* is of comparable relative thickness to that of *P. barbarae*. The measurements are tabulated below.

Anteroposterior thickness of (1) medial condyle, (2) intercondylar groove, (3) lateral condyle, (4) groove thickness as a percentage of medial condyle thickness.

| | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| *P. barbarae* (2) | 10.2 | 6.7 | 9.6 | 6.7% |
| *P. nasi* (2) | 9.4 | 5.8 | 8.7 | 6.2% |
| *P. hookeri* (1) | 7.6 | 5.2 | 6.8 | 6.8% |

MEASUREMENTS. See pages 22-23.

FIG. 2. *Pediorallus barbarae* showing fit of tibiotarsal and tarsometatarsal specimens.

## *Pediorallus nasi* sp. nov.

(Figs 3–5)

ETYMOLOGY. The specific name is derived from the Latin *nasus* (a nose) from which the terminal part of the name of the type locality, Walton-on-the-Naze, is also derived.

DIAGNOSIS. Intermediate in size between *P. barbarae* and *P. hookeri*. Distal end of tibiotarsus broad, with shallow intercondylar trochlea. Lateral (external) condyle rounded with anterior projection short and blunt. Medial (internal) condyle with distal notch, the anterior end elongated with an anteromedial slant. In anterior view medial condyle showing proximomedial thrust to medial ligamental prominence, and with deep hollow undercutting proximolateral ligamental canal narrow and sited near medial edge of anterior surface of shaft. Supratendinal bridge absent. Anteriorly raised area lateral to site of supratendinal bridge with prominent tubercle. Distal end of femur with deep and narrow rotular groove; lateral condyle well-developed posteriorly and abruptly cut away at the proximal end. Proximal head of humerus palmarly flattened and anconally rounded, with fairly narrow capital groove. Proximal head of ulna with deep transverse radial depression. The palmar side of the lateral edge of the lateral cotyla curves distally to shaft without any palmarly prominent projection.

MATERIAL. Holotype six associated bone fragments (BMNH A5200) comprising a proximal end of a right ulna, proximal head of a left humerus, distal end of a right tibiotarsus, distal end of a right femur and two vertebrae, collected by W. H. George in 1977. Tentatively referred specimens, a distal end of a left humerus (BMNH A4490), collected by A. Gale and presented in 1969, a distal end of a left tibiotarsus (BMNH A5201) collected by A. Wrigley, a distal end of a left femur (BMNH A5278) and proximal end of a right tarsometatarsus (BMNH A5279), collected and presented by T. Bassett in 1982, and distal end of a right femur (BMNH A4270), collected and presented by N. Chapman in 1973.

OCCURRENCE. Divisions A-E, London Clay (Ypresian); Lower Eocene. The holotype is from Division A, London Clay, Walton-on-the-Naze, Essex; the distal end of a humerus from Division B, Herne Bay, Kent; and the portions of tibiotarsus, tarsometatarsus and femora from Divisions D-E, Isle of Sheppey, Kent.

DESCRIPTION AND COMMENTS. The holotype (BMNH A5200) consists of the only associated material of the taxon from the British Lower Eocene. Unfortunately the diagnotic specimens consist of portions of limb bones broken off close to the ends. However, they help to confirm the association of other material, widen our knowledge of these birds and confirm earlier impressions.

The distal end of a tibiotarsus, although broken off near the end of the shaft, retains its anterior features (Fig. 3). As with the other specimens the supratendinal bridge is absent.

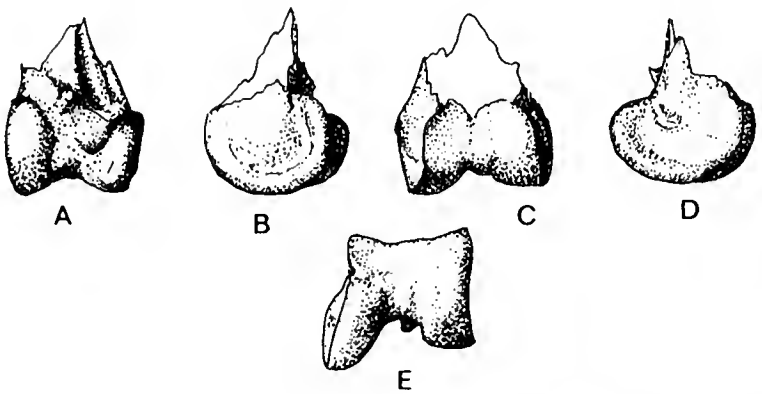


FIG. 3. *Pediorallus nasi.* Distal end of right tibiotarsus of holotype, A5200. Views – A anterior, B lateral, C posterior, D medial, E distal.

There is a small rounded tubercle projecting anteriorly near the mid-line of the shaft, and just distal to where a bridge would have been. The medially-sited tendinal canal on the anterior surface of the shaft curves towards the proximal base of the medial condyle. The latter projects anteromedially as in the other species, and is undercut proximally. Anteriorly it projects well beyond the lateral condyle which is blunted and rounded. Distally the intercondylar groove is shallow, with a slightly deeper groove towards the medial side. The medial condyle has a small notch on its distal edge.

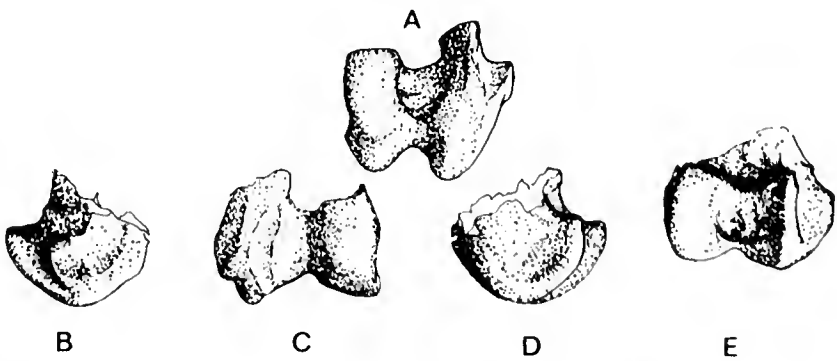


FIG. 4. *Pediorallus nasi.* Distal end of right femur of holotype, A5200. Views – A distal, B lateral, C posterior, D medial, E anterior.

The distal end of a femur is broad and blunt (Fig. 4). The medial condyle is distoposteriorly flattened, and hollowed on its medial surface, with a well-marked scar of ligamental attachment. In the intercondylar fossa the ligamental impression is large and deep. The lateral condyle is posteriorly prominent; and like the medial condyle is abruptly cut away at the distal edge of the popliteal hollow, forming a sharp projection. It is bordered abruptly by the fibular groove. The fibular condyle does not project posteriorly and has a distinct attachment hollow at its proximal base. The popliteal hollow is deep, and the rotular groove deep and narrow. Both the last features are incomplete in the holotype, the specimen being broken across close behind the head, but the other two femoral ends from Sheppy both retain portions of the shaft.

The ulna consists only of the proximal end of the bone, with little of the lateral surface present (Fig. 5). The medial condyle is typically palmaranconally elongated and fairly

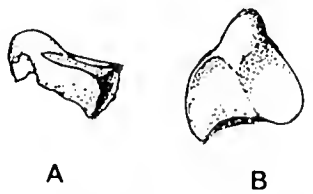


FIG. 5. *Pediorallus nasi.* Proximal end of right ulna of holotype, A5200. Views – A lateral, B proximal.

deeply curved. The olecranon is proximally eroded. The lateral condyle lacks a palmar extension of the distally curving lateral edge. It terminates in a distinct deep proximal radial depression slanting distolaterally from the palmar edge of the medial cotyla.

The proximal head of the humerus provides little information. It is more evenly rounded proximally and projects less than do those of Recent species of rails. It is palmaranconally compressed and laterally elongated. The palmar side is fairly flat, and the anconal side rounded. Although incomplete the capital groove appears to have been narrow.

MEASUREMENTS. See pages 22-23.

### *Pediorallus hookeri* sp. nov.

ETYMOLOGY. The species is named after J. J. Hooker, a colleague working on Tertiary fossil mammals, who collected and presented this and other specimens.

DIAGNOSIS. Smaller than both *P. barbarae* and *P. nasi*, bone ends comparable in general size with those of the recent coot *Fulica atra*. Distal end of tibiotarsus with anteroposterior thickness of intercondylar groove proportionally similar to that of *P. barbarae*.

MATERIAL. Holotype a distal end of a left tibiotarsus (BMNH A5202) collected and presented by J. J. Hooker in September 1980. Tentatively referred specimens; a proximal end of a left tarsometatarsus (BMNH A3701) collected by C. A. Walker in 1964, another (BMNH A4278) collected by A. P. Currant in April 1973, a proximal end of a right tarsometatarsus (BMNH A5203) collected and presented by J. Adams in August 1977, and a distal end of a left humerus (BMNH A3679) collected by E. M. Venables and presented in 1963.

OCCURRENCE. Divisions B-E, London Clay (Ypresian); Lower Eocene. The holotype and leg bones are from Divisions D-E, Warden Point, Isle of Sheppey, Kent; the humerus from Division B, Bognor Regis, Sussex.

DESCRIPTION AND COMMENTS. The holotype is a small, stout, distal end of a tibiotarsus with a short length of shaft. It is slightly worn on some edges, but in good condition and showing all the characters of the genus. It has the stouter intercondylar groove shared with *P. barbarae* (Fig. 1F and measurements pp. 22-23) and the tendinal canal appears a little deeper and broader. The proximal ends of the tarsometatarsi also resemble smaller versions of those of the larger species, but they tend to have proportionally stouter shafts, as is apparent from the measurements of the thickness of the sides in the region of the hypotarsus.

MEASUREMENTS. See below.

## Comparative Measurements of *Pediorallus* Material

Since a number of specimens of several species are involved it seemed most useful to bring the measurements together and to tabulate these where

convenient. It should be noted that the specimens are mostly incomplete and the length given for a specimen may not be that of a complete bone, and in this instance not useful for comparative purposes, and are given in parentheses.

TARSOMETATARSUS. Measurements in millimetres — A, greatest length (see note above); B, width across cotylae; C, thickness from intercondylar prominence to hypotarsus (specimens show varying amounts of wear); D, thickness of medial (internal) side level with distal end of hypotarsus; E, thickness of lateral (external) side at same point; F, length of hypotarsus; G, length of medial calcaneal ridge.

| | *P. barbarae* | | | | *P. nasi* | *P. hookeri* | | |
|---|---|---|---|---|---|---|---|---|
| Specimens | A3681 | GSM4805 | A5195 | A5197 | A5279 | A4278 | A5203 | A3701 |
| A | (31.3) | 94.8 | (18.0) | (12.6) | (23.3) | (13.3) | (22.7) | (15.9) |
| B | 10.9 | 10.8 | 11.5 | 11.3 | — | 7.8 | 7.7 | 7.2 |
| C | 10.1 | 10.3 | 9.8 | 10.5 | 8.2 | 5.4 | 6.4 | 6.9 |
| D | 1.8 | 1.8 | 2.2 | 2.5 | 1.7 | 1.8 | 1.8 | 1.5 |
| E | 3.4 | 3.8 | 3.9 | 4.0 | 3.5 | 2.4 | 2.9 | 2.5 |
| F | 5.5 | 5.5 | 6.0 | 5.9 | 4.8 | 4.3 | 4.4 | 4.1 |
| G | 2.8 | 2.8 | 2.7 | 3.0 | — | — | — | 1.7 |

TIBIOTARSUS. Key to measurements — A, greatest length (see note above); B, posterior width across condyles; C, anterior distal width across condyles; D, anterior proximal width across condyles; E, anterior length of medial condyle; F, anterior length of lateral condyle; G, anterior width of medial condyle; H, anterior width of lateral condyle; I, anteroposterior thickness of medial condyle; J, anteroposterior thickness of lateral condyle; K, anteroposterior thickness of intercondylar groove; L, width of shaft at 20mm from distal end; M, thickness of shaft at same point; N, medial edge of shaft to tendinal canal at 20mm from distal end; O, medial edge of shaft to tendinal canal just below normal site of tendinal bridge.

| | *P. barbarae* | | | *P. nasi* | *P. hookeri* |
|---|---|---|---|---|---|
| Specimens | A5198 | A5199 | A5200 | A5201 (worn) | A5202 |
| A | (30.1) | (51.0) | (13.8) | (12.6) | (15.2) |
| B | — | 9.4 | 8.4 | — | 6.1 |
| C | 10.0 | 10.0 | 9.2 | — | 6.8 |
| D | 11.0 | 11.1 | 10.0 | — | 7.8 |
| E | 6.8 | 6.7 | 6.5 | — | 4.9 |
| F | 7.4 | 7.3 | 7.1 | — | 5.8 |
| G | 3.7 | 3.6 | 3.4 | — | 2.8 |
| H | 3.9 | 3.9 | 3.7 | 3.7 | 3.1 |
| I | — | 10.2 | 9.4 | — | 7.6 |
| J | 9.8 | 9.6 | 8.7 | 8.7 | 6.8 |
| K | 6.7 | 6.7 | 5.8 | 5.8 | 5.2 |
| L | 6.9 | 6.6 | — | — | — |
| M | 4.8 | 5.1 | — | — | — |
| N | 0.7 | 0.8 | — | — | — |
| O | — | 1.3 | 1.5 | 1.1 | 1.2 |

HUMERUS. Key to measurements — A, greatest length (see note above); B, distal length to medial condyle; C, length to lateral condyle; D, distal width; E, thickness at distal lateral edge; F, width of shaft at proximal end of brachialis anticus scar; G, thickness of shaft at same point; H, length of brachialis anticus scar; J, width of proximal head; K, thickness of head; L, head thickness at lateral end; M, head thickness at edge of capital groove.

| | *P. nasi* | | *P. hookeri* |
|---|---|---|---|
| Specimens | A4490 | A5200 | A3679 |
| A | (28.2) | — | (23.9) |
| B | (28.0) | — | (23.5) |
| C | (27.4) | — | (22.8) |
| D | 13.1 | — | 10.7 |
| E | 7.2 | — | 6.3 |
| F | 6.7 | — | 6.3 |
| G | 4.8 | — | 3.9 |
| H | 9.0 | — | 7.5 |
| I | 3.1 | — | 3.2 |
| J | — | 13.5 | — |
| K | — | 6.0 | — |
| L | — | 3.2 | — |
| M | — | 3.5 | — |

ULNA. *P. nasi*, part of holotype A5200. Proximal width 9.3; palmar/anconal thickness 11.0; length and width of medial cotyla 6.3 4.4; length and width of lateral cotyla 5.4 4.8; palmar length of lateral cotyla lip 2.0; width of proximal radial depression 5.5.

FEMUR. *P. nasi*, part of holotype A5200, combined with A5278. Greatest distal width 13.0; anterior width 10.0; width of rotular groove *c.* 3.3; posterior width of radial condyle 4.2, of lateral condyle 3.0; anteroposterior thickness of medial condyle 9.0, of lateral condyle 11.5, of fibular condyle 9.5; length of medial condyle 7.4, of lateral condyle 8.8, of fibular condyle 5.4.

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# Interglacial Fossils from Upminster, Essex

by G. R. WARD*

In July 1974 Mr M. D. Weller, an employee of Scott Hale (Contractors) Ltd, brought to my attention an occurrence of shells of the bivalve *Corbicula fluminalis* in an excavation for the Corbets Tey Sewer. More shells of this and other species of freshwater mollusc were subsequently collected from a heap of shelly sandy clay and sand adjacent to a flooded shaft (TQ 54978504) sunk to a depth of 8.5 m on the N side of Park Farm Road, 100 m ESE of Park Corner Farm, situated just within the boundary of the parish of Upminster, in the London Borough of Havering. The deposit from which the shells had come was unfortunately not visible at the time of our visit, as the shaft was flooded to within 3.5 m of the surface. A section was however recorded in a site investigation borehole (C1) sunk in precisely the same place in November 1973 (Table 1).

TABLE 1. Section in borehole.

| | thickness m | depth m |
|---|---|---|
| Topsoil [surface at +15.3 m O.D.] | 0.2 | 0.2 |
| Clay, soft brown loamy silty | 2.8 | 3.0 |
| Silt, light brown slightly clayey sandy | 3.5 | 6.5 |
| Sand, medium coarse, and gravel | 1.0 | 7.5 |
| Clay, firm brown } [London Clay] | 1.0 | 8.5 |
| Clay, blue-grey } [London Clay] | 1.0+ | 9.5 |

There is no mention of shells in the borehole description, but the presence of light brown silty clay and silt within some of the shells collected suggests that some, at least, came from the finer sediments. Fragments of laminated silty clay were observed in the heap, and bluish-grey earthy calcareous nodules.

Records of other site investigation boreholes put down along Park Farm Road prove that a sequence of clayey and sandy sediments up to 10 m thick occupies a broad depression in the London Clay, extending down to 6 m above O.D. about 350 m ESE of Park Corner Farm.

The species listed (Table 2) were obtained from the heap of sediment adjacent to the flooded shaft by hand-picking in the field and by processing a bulk sample in the laboratory. All fossils listed are preserved in the Passmore Edwards Museum, Stratford, London E15 4LZ.

TABLE 2. List of fossils from Interglacial deposit, Park Farm Road, Upminster.

| | | A | B |
|---|---|---|---|
| PLANTAE | | | |
| *Alnus glutinosa* (Linné) | c | 6 | — |
| *Chara* spp. | | — | 164 |
| *Chenopodiaceae* | s | — | 16 |
| ?*Cornus* sp. | s | 4 | 1 |
| *Naias flexilis* Rostk. & Schmidt | | 1 | 1 |
| *Potamogeton* sp. | fs | — | 1 |
| *Rubus idaeus* Linné | fs+sn | 3 sn | 10fs+7sn |
| *Stellaria graminea* Linné | s | — | 2 |
| MOLLUSCA: BIVALVIA | | | |
| *Corbicula fluminalis* (Müller) | | 105 | 96 |

* 76 Hunter Avenue, Shenfield, Brentwood, Essex CM15 8PG.

| | | A | B |
|---|---|---|---|
| *Pisidium amnicum* (Müller) | | 6 | |
| *P. casertanum* (Poli) | | | |
| *P. henslowanum* (Sheppard) | | | |
| *P. nitidum* Jenyns | | 2 | 303 |
| *P. moitessierianum* Paladilhe | | | |
| *P. supinum* Schmidt | | | |
| *Unio pictorum* (Linné) | | 3 | |
| *U. tumidus* Philipsson | | 1 | ff |
| MOLLUSCA: GASTROPODA | | | |
| *Aegopinella nitidula* (Draparnaud) | | — | 1 |
| *Ancylus fluviatilis* Müller | | 5 | 22 |
| *Anisus leucostoma* (Millet) | | 1 | — |
| *A. vorticulus* (Troschel) | | — | 2 |
| *Armiger crista* (Linné) | | — | 123 |
| *Belgrandia marginata* (Michaud) | | — | 58 |
| *Bithynia tentaculata* (Linné) | | 38 | 52+92op |
| * *Carychium minimum* Müller | | — | 2 |
| * *Cepaea* sp. | | — | 1 |
| * *Clausilia* sp. | | — | 1 |
| * *Cochlicopa lubrica* (Müller) | | — | 1 |
| *Gyraulus albus* (Müller) | | 2 | 96 |
| *G.* cf. *laevis* (Alder) | | 1 | — |
| * cf. *Helicella* sp. | | — | 1 |
| *Hydrobia* cf. *ventrosa* (Montagu) | | — | 2 |
| *Lymnaea auricularia* (Linné) | | 18 | — |
| *L. peregra* (Müller) | | 4 | 38 |
| *Planorbis carinatus* Müller | | 1 | 1 |
| * *Punctum pygmaeum* (Draparnaud) | | — | 2 |
| * *Pupilla muscorum* (Linné) | | — | 1 |
| * *Vallonia costata* (Müller) | | — | 5 |
| * *V. pulchella* (Müller) | | — | 1 |
| * *V. pulchella/excentrica* | | — | 10 |
| *Valvata cristata* Müller | | — | 5 |
| *V. piscinalis* (Müller) | | 2 | 247 |
| * *Vertigo angustior* Jeffreys | | — | 1+?1 |
| ARTHROPODA: INSECTA | | | |
| Coleoptera, indeterminate | | — | ff |
| Diptera, Chironomidae | | — | abundant |
| ARTHROPODA: OSTRACODA | | | |
| *Cyprideis torosa* (Jones) | | — | 10 |
| *Cypris pubera* Müller | | — | 1 |
| PISCES | | | |
| Cyprinidae, genus indet. | t | — | 3 |
| *Gymnocephalus cernua* (Linné) | sc | — | 3 |
| cf. *Leuciscus* sp. | t | — | 4 |
| Percoidae | ?p | — | 1 |
| AMPHIBIA (?) | | | |
| indeterminate | b | — | 3 |
| FORAMINIFERIDA | | | |
| Derived (from London Clay): '*Marginulina*' 1, '*Nodosaria*' 1 | | | |

*Abbreviations:* b, bones; c, cones; ff, fragments; fs, fruitstones; op, opercula; p, preoperculum; s, seeds; sc, sacculiths; sn, spines; t, teeth.

Numbers of bivalves and ostracods refer to single valves.

* land snails.

A, Hand-picked in the field.
B, From a bulk sample (1.5 kg) wet-sieved to 500 μm.

The Mollusca are mostly freshwater species. The presence of the bivalve *Corbicula fluminalis,* which no longer lives in Britain, and the extinct gastropod *Belgrandia marginata,* indicate that the deposit was formed before the last glaciation. *Corbicula fluminalis, Unio,* and *Ancylus fluviatilis* are all characteristic of moving water, and the deposit was probably formed in a river during the Ipswichian Interglacial. Similar deposits containing *Corbicula fluminalis* at other localities in the Thames Valley have been described, as, for example, at Ilford (Kennard and Woodward 1900, Rolfe 1958), Aveley (Cooper 1972), and Purfleet (Hollin 1977).

The presence of the gastropod *Hydrobia* cf. *ventrosa* and the strongly noded character of the carapaces of the marine ostracod *Cyprideis torosa,* a species very common in the shelly channel at Purfleet, signify a brackish water environment, and suggest a northward expansion of Thames estuary conditions.

## Acknowledgements

I wish to thank Mr M. D. Weller for bringing this occurrence to my attention, to Mr K. H. Dawes and Mr B. G. J. Wilson of the Borough Engineer and Surveyor's Department, London Borough of Havering, for making available reports on site investigations for the Corbets Tey Sewer, and to Mr S. W. Vincent for assistance in the field. My special thanks are due to Dr R. C. Preece of Imperial College for kindly sorting out and identifying the Mollusca recovered from the bulk sample; to Mr J. Cooper of the British Museum (Natural History) for naming the other Mollusca; to Dr F. Davies of the Royal Botanic Gardens, Kew, for identifying the plant remains; to Dr J. E. Robinson of University College London, for identifying and commenting on the ostracods; to the late Mr F. C. Stinton for identifying the otoliths; to Dr P. H. Greenwood and G. Howes of the B.M.(N.H.) for identifying the fish teeth; and to Mr E. A. Jarzembowski, also of the B.M.(N.H.), for examining the insect remains.

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# Book Review

*Guide to the Prices of Antiquarian and Secondhand Botanical Books (1979-1982): Flowering Plants.* By L. Vogelenzang. Boerhaave Press (P.O. Box 1051. 2302 BB Leiden, Netherlands). 1983. 760 pp. Dfl. 85.00 ISBN 90 70153 17 3.

This novel work has been produced by taking the offer prices of more than 8,000 titles from the lists of 74 dealers over a four-year period, converting them into Deutschmarks and U.S. dollars, and indexing the books alphabetically by authors. For instance, under Kent, D. H. & Lousley, J. E. (eds.) one can find that *A hand list of the plants of the London area,* issued as supplements to *The London Naturalist* **30-38** (1951-57), was offered for DM 85.00 ($46.00) in 1980 but only DM 81.00 ($35.00) in 1982. It is hard to see what purpose the book could serve. Plenty of bibliographical data are supplied but it cannot be used as a comprehensive bibliography because works not appearing in any catalogue during those four years are excluded. It is not a reliable guide to the value of the books in a collection because no indication of the condition of the copies offered is given. My own copy of the *Hand list,* to continue the example given, is a scruffy set of loose parts copiously marked in pencil, not worth half as much as some nicely bound-up sets I have seen in libraries. The apparent drop in value from 1980 to 1982 could also be the result of fluctuation in the value of the pound, or the higher price could include the cost of postage and packing and the lower not — dealers' practices vary. The guide gives no hint of these difficulties.

R. M. Burton

# The Flora of the M25 Site in Epping Forest

by JUDITH L. ADAMS*

## Summary

Epping Forest is one of the many areas to be affected by the building of the London Orbital Motorway, the M25. A cut-and-cover tunnel now crosses the Forest at Bell Common South. This paper looks in detail at this site, with particular reference to its vegetation prior to the construction of the tunnel.

## Introduction

The M25, after many years of consultation, is now nearing completion and out of a total of 194 kilometres, approximately 128 are now (spring 1984) finished. The section between the A10 and the M11, which cuts through Epping Forest at Bell Common South, was officially opened in January, 1984. The road crosses Forest land through a cut-and-cover tunnel and an agreement has been reached to re-seed the area with species typical of the area prior to the work. Trees will not be permitted to grow over the tunnel, so management will be essential.

The intention of this paper is to document the site in detail — as an example of one of the many such sites to be affected — and to serve as a baseline against which the impact of the motorway on Bell Common may be assessed. In addition, the site is typical, both with regard to species composition and pressure on the site, of the many areas of grassland and scrub in the Forest.

This paper is based on a survey carried out during the summer of 1981. With the subsequent construction of the motorway a number of the features referred to in this report have disappeared. The route of the M25 is clearly marked in Figure 1.

## The Site

Bell Common South, or Mill Plain as it is often called (GR TL4401), forms part of Epping Forest which is protected by the Epping Forest Act of 1878, and as such was dedicated by Queen Victoria for 'the enjoyment of my people for ever'.

It is located just to the south of Epping Town and is bounded by the B1393 (previously the A11) on the northwest, Ivy Chimneys Road and housing on the north and east and Epping Thicks (an area of oak, holly and hornbeam) in the south. It encompasses an area of about 5.5 hectares at an altitude of 107 metres and is one of the few areas of Epping Forest on glacial gravel overlain by chalky boulder clay. The pH of the soil is approximately 6.0.

The site included areas of both grassland and scrub. The grassland along the roadsides and at the southern end of the plain was rough and the remainder included the cricket pitch, which was returfed in 1948, and its surrounds. Much of the remaining area had reverted to scrub — particularly during the last fifty years since the decline in grazing. In certain areas blackthorn *Prunus spinosa* dominated, whereas in others extensive oak *Quercus robur* scrub had developed. In addition, there were three small ponds. One remains immediately next to the B1393 and a second, which was almost entirely overshadowed by trees, occurred in the eastern part of the area. The site of a third pond was evident, though it had been invaded by willow *Salix* spp.

Historically, the area is rich in its associations. It was the site of one of the two windmills in Eppingbury Manor and certainly a windmill was there in 1595 and

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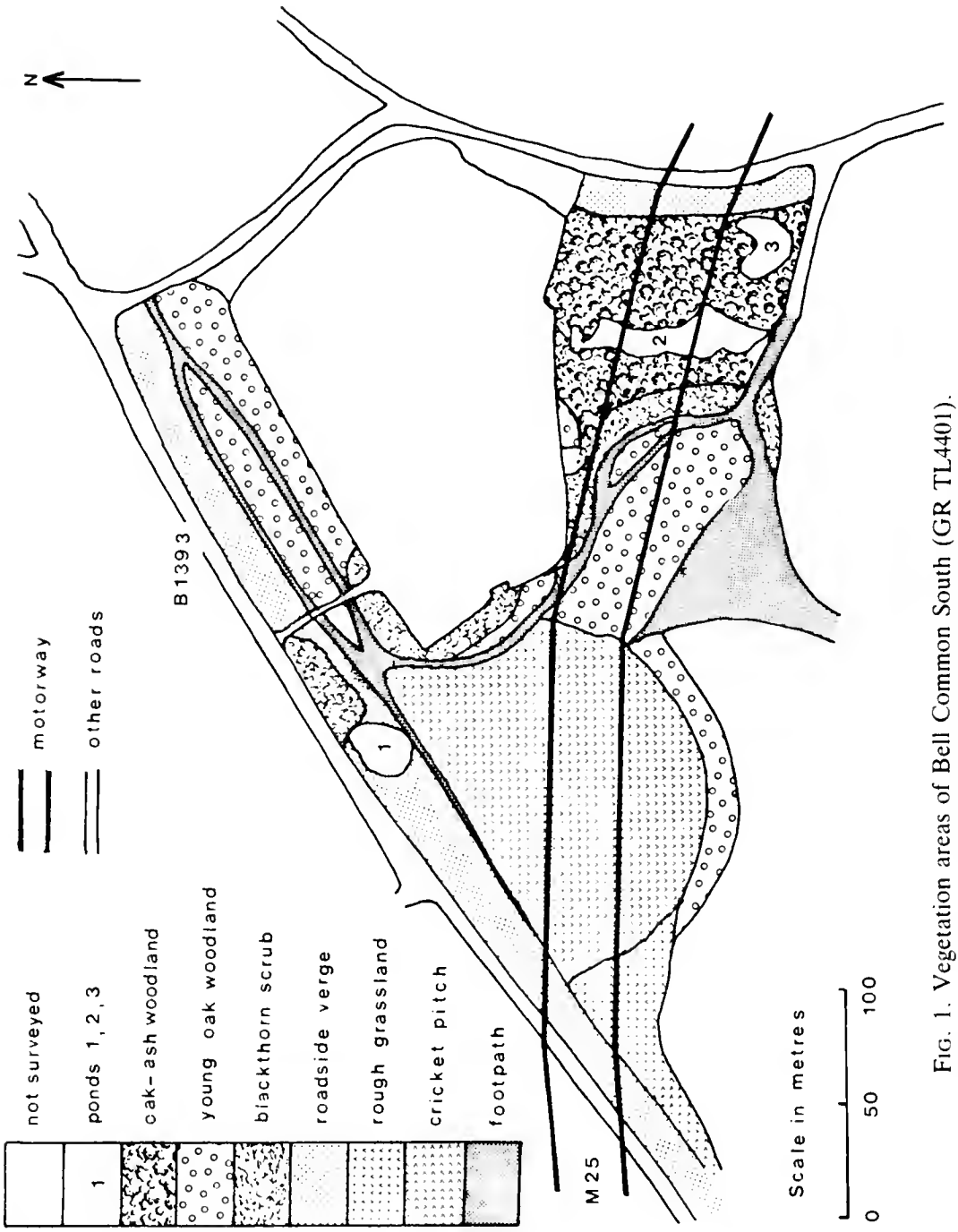


FIG. 1. Vegetation areas of Bell Common South (GR TL4401).

latterly in 1840, though it had gone by 1895. It was also the site of the Epping Foresters' Cricket Club, founded in 1947, but it had been used as a cricket pitch as early as 1850. The area has been heavily used, largely for informal recreation and horse riding. Epping Town has a population of about 12,000 (Epping Town Council 1981).

## Methods

From a field survey a map was prepared to show the extent of the main types of vegetation (Fig. 1). For each area the more conspicuous species were listed. The higher plant species of the largest area affected by the motorway, the cricket pitch and surrounds, were recorded in greater detail. The names of the species follow Clapham, Tutin and Warburg (1962).

## The Vegetation

The freshwater ponds, woodland and scrub and the grassland areas are now considered.

### *(a) Vegetation of the ponds*

**Pond 1:** Bell Common Pond, formerly used as a horse pond, supported a variety of plants; floating-leaf aquatics, emergent species and areas of marsh. It is in need of management work as it tends to dry out in warm summers. Moorhens nested here in 1980 and other species were occasional visitors. This pond remains.

Floating aquatics included:

*Lemna minor*
*Lemna trisulca*
*Potamogeton natans*
*Ranunculus aquatilis*

Emergent species included:

*Alisma plantago-aquatica*
*Eleocharis palustris*
*Glyceria fluitans*
*Sparganium emersum*
*Sparganium erectum*
*Typha latifolia*

Of particular interest is the extensive area of moss and liverwort, including *Riccia fluitans*.

Marsh species included:

*Apium nodiflorum*
*Bidens cernua*
*Cardamine flexuosa*
*Epilobium palustre*
*Epilobium hirsutum*
*Galium palustre*
*Gnaphalium uliginosum*
*Heracleum sphondylium*
*Hydrocotyle vulgaris*
*Juncus acutiflorus*
*Juncus effusus*
*Juncus inflexus*
*Myosotis caespitosa*
*Salix* sp.
*Solanum dulcamara*

**Pond 2:** This pond was completely surrounded by trees and the resulting dense shade prohibited extensive growth of aquatic macrophytes. There were large areas of silt and the only open water, supporting a few floating aquatics, was found at the eastern end of the pond. The most notable feature was the presence of amphibious bistort *Polygonum amphibium* which is rarely recorded elsewhere in the Forest.

Trees overhanging the pond included:

*Crataegus monogyna*
*Fraxinus excelsior*
*Ilex aquifolium*
*Salix* sp.
*Quercus robur*
*Thelycrania sanguinea*

Aquatic and marsh species included:

*Alisma plantago-aquatica*
*Apium nodiflorum*
*Callitriche stagnalis*
*Carex otrubae*
*Glechoma hederacea*
*Gnaphalium uliginosum*
*Iris pseudacorus*
*Lemna minor*
*Lycopus europaeus*
*Lysimachia nummularia*
*Myosotis caespitosa*
*Polygonum amphibium*
*Sonchus oleraceus*

**Pond 3:** The site of a third pond remained though it had been invaded by willow *Salix* sp. and there was no open water. By the summer of 1982 both this pond and pond 2 had been destroyed.

## *(b) Vegetation of woodland and scrub*

Only 10-15% of the area was covered by trees more than 50 years old. However, approximately one-third of the area consisted of young oak or dense blackthorn scrub. This rate of encroachment of the grassland by scrub is similar to results previously documented for Epping Forest. Decline in the grazing pressure of cattle and rabbits and a reduction in management were cited as the causes (Ranson 1978).

### (i) Oak-ash woodland

This young secondary woodland was virtually impenetrable in places. The mature trees, no more than about 100 years old, were primarily oak and ash *Fraxinus excelsior:* the ash is an indicator of the chalky boulder clay. The dense shrub layer consisted of hawthorn *Crataegus monogyna,* holly *Ilex aquifolium,* blackthorn and elder *Sambucus nigra.* Foxes and rabbits were found in the wood.

Non-woody species included:

*Arum maculatum*
*Brachypodium sylvaticum*
*Dryopteris filix-mas*
*Hedera helix*
*Pteridium aquilinum*
*Rosa arvensis*
*Rubus fruticosus*
*Stachys sylvatica*
*Tamus communis*
*Urtica dioica*

### (ii) Young oak woodland

There were two extensive areas of dense young oak. The one nearest the B1393 supported trees about 10 metres tall and little other vegetation and is not directly affected by the motorway construction. Some bramble *Rubus fruticosus* and grass *Holcus mollis* occurred. The second area of young oak extended from the oak-ash woodland west on to the cricket pitch. These trees have gone.

### (iii) Blackthorn scrub

Impenetrable blackthorn scrub, with little other vegetation, was found in several areas. There was much evidence of rabbit activity.

## *(c) Vegetation of the grassland*

Most of the grassland was destroyed by the building of the tunnel, but it is this vegetation type which will be established over the tunnel. For this reason, it is considered in greater detail and is subdivided as follows:

(i) Roadside verges — along the B1393 and along the eastern edge.
(ii) Rough grassland.
(iii) Cricket pitch (and surrounds).

### (i) Roadside verges

The roadside verge along the B1393 varied throughout its length. The northern end contained several trees, probably planted, including lime *Tilia* × *europaea* and horse chestnut *Aesculus hippocastanum.* Other tree species included

hawthorn *Crataegus monogyna*, ash *Fraxinus excelsior*, oak and apple *Malus* sp.

A variety of non-woody species, typical of roadside verges occurred and as one progressed from north to southwest, tufted hair grass *Deschampsia caespitosa* became increasingly important. At the southwestern end and at the end of the cricket pitch, it was dominant.

The northern and middle areas were mainly false oat grass *Arrhenatherum elatius* though not exclusively so.

Grasses included:

*Argrostis tenuis*
*Argrostis stolonifera*
*Arrhenatherum elatius*
*Dactylis glomerata*
*Deschampsia caespitosa*
*Holcus lanatus*
*Lolium perenne*
*Phleum bertolonii*
*Phleum pratense*
*Poa trivialis*

Other flowering plants included:

*Achillea millefolium*
*Artemisia vulgaris*
*Carex hirta*
*Centaurea nigra*
*Cirsium arvense*
*Cirsium vulgare*
*Chamaenerion angustifolium*
*Epilobium hirsutum*
*Galium aparine*
*Galium saxatile*
*Lamium alba*
*Matricaria matricarioides*
*Plantago major*
*Potentilla anserina*
*Potentilla erecta*
*Polygonum aviculare*
*Polygonum persicaria*
*Ranunculus repens*
*Rubus fruticosus*
*Rumex conglomerata*
*Rumex sanguineus* var. *viridis*
*Senecio jacobaea*
*Solanum dulcamara*
*Ulex europaeus*
*Urtica dioica*

Marshy trampled areas contained species including:

*Bidens cernua*
*Bidens tripartita*
*Callitriche stagnalis*
*Gnaphalium uliginosum*
*Juncus bufonius*
*Juncus effusus*
*Polygonum hydropiper*
*Polygonum persicaria*

The roadside verge, along the eastern edge, was approximately 5 metres in width and supported a diverse flora, including both shrubs and non-woody species. Some hawthorn, blackthorn and crab-apple *Malus sylvestris* were present.

Non-woody species included:

*Achillea millefolium*
*Alliaria petiolata*
*Arrhenatherum elatius*
*Centaurea nigra*
*Cirsium arvense*
*Chamaenerion angustifolium*
*Epilobium hirsutum*
*Galium aparine*
*Holcus lanatus*
*Lolium perenne*
*Plantago lanceolata*
*Plantago major*
*Polygonum aviculare*
*Potentilla anserina*
*Taraxacum officinale*
*Tussilago farfara*
*Urtica dioica*

**(ii) Rough grassland**

The area south of the cricket pitch and the adjoining verge were dominated by tufted hair grass. Within this area small deep patches dominated by rushes, especially *Juncus effusus*, occurred.

Other species included:

*Arrhenatherum elatius*
*Artemisia vulgaris*
*Carex hirta*
*Cirsium palustre*
*Cirsium vulgare*
*Chamaenerion angustifolium*
*Rumex acetosella* var. *angiocarpus*
*Rumex crispus*
*Rubus fruticosus*
*Senecio jacobaea*

**(iii) Cricket pitch (and surrounds)**

The cricket pitch contained a rich mosaic of vegetation. Some areas were essentially heathland, supporting such species as oval sedge *Carex ovalis*, mat grass *Nardus stricta*, with heath bedstraw *Galium saxatile* and tormentil *Potentilla erecta*. Other areas were covered with lesser stitchwort *Stellaria graminea* and greater birdsfoot trefoil *Lotus pedunculatus*.

Fox, rabbit, mole, frog and toad were seen in 1981; whilst trapping revealed field vole and shrew.

Grasses, sedges and rushes included:

*Agrostis canina*
*Agrostis tenuis*
*Agrostis stolonifera*
*Alopecurus pratensis*
*Carex hirta*
*Carex ovalis*
*Festuca pratensis*
*Festuca rubra*
*Holcus lanatus*
*Lolium perenne*
*Luzula campestris*
*Nardus stricta*

Other flowering species included:

*Achillea millefolium*
*Centaurea nigra*
*Cirsium vulgare*
*Cirsium arvense*
*Galium saxatile*
*Galium verum*
*Lotus corniculatus*
*Lotus pedunculatus*
*Potentilla erecta*
*Prunella vulgaris*
*Rumex acetosella* var. *angiocarpus*
*Stellaria graminea*

## Discussion

While Bell Common South was of little ecological significance at the national level, it was typical of many of the grassland/scrub areas in Epping Forest. Many such grassland areas are under threat, due largely to scrub encroachment.

The decline in extent of grassland areas in the Forest is documented, and rates of encroachment on several Forest sites have been assessed at between 1.1 and 1.4 metres per year (Ranson 1978). For this reason it was particularly important that the M25 should pass under the Forest and grassland be reinstated. The tunnel also ensures that the continuity of the Forest is maintained.

On the basis of technical advice from the Nature Conservancy Council and the Epping Forest Conservation Centre, the Conservators of Epping Forest have agreed that the Department of Transport should reinstate the whole area, including the motorway embankments, according to the following specifications (Superintendent of Epping Forest, pers. comm.). The material covering the tunnel will be approximately 80 cm thick and consist of topsoil underlain by peat on a drainage layer of clay pellets. The surface will drain to the south and will contain several mounds. The whole area will be seeded with a mixture, the specifications of which are shown in Table 1. In due course, shrubs may be planted, but the species and precise locations had not been determined at the time of going to press.

TABLE 1. Grass seed mixture specification for Bell Common South.

| Forest Mixture | Parts by mass | Proportions by mass |
|---|---|---|
| 'Phleom Pratense S50' | 8.5 kg | 17% |
| *Cynosurus cristatus* | 9.0 kg | 18% |
| 'Festuca Quina Azay' | 10.0 kg | 20% |
| 'Westerwolds Annual Rye Grass' | 7.5 kg | 15% |
| *Anthoxanthum odoratum* | 5.0 kg | 10% |
| Herb Mixture (as below) | 10.0 kg | 20% |
| | 50.0 kg | |

The herb mixture will contain the species in the proportions by weight as follows:

| | | | |
|---|---|---|---|
| *Achillea millefolium* | 5% | *Galium verum* | 2½% |
| *Lotus corniculatus* | 10% | *Daucus carota* | 5% |
| *Trifolium pratense* | 15% | *Vicia sativa* | 15% |
| *Trifolium repens* | 5% | *Vicia cracca* | 10% |
| *Primula vulgaris* | 5% | *Anthyllis vulneraria* | 5% |
| *Reseda lutea* | 2½% | *Silene dioica* | 2½% |
| *Plantago lanceolata* | 5% | *Silene album* | 2½% |
| *Chrysanthemum leucanthemum* | 5% | *Bellis perennis* | 5% |

While the building of the tunnel will certainly affect local drainage, it will be interesting to see how the reinstated grassland compares with that which it replaces. Further studies will need to be undertaken over a period to time to monitor the species composition of this area in relation to both the base-line provided by this study and the specification for re-seeding.

## Acknowledgements

I would like to thank Epping Forest Conservation Centre for its support during the project. I am grateful to the Superintendent of Epping Forest for the information he provided. In addition, I would like to acknowledge particular assistance from Peter Adams, Joan Taylor, Valerie Taylor and Diana Watmough.

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# Book Review

*British and Irish herbaria: an index to the location of herbaria of British and Irish vascular plants.* By D. H. Kent and D. E. Allen. Botanical Society of the British Isles, London. 1984. 333 pp. £13. ISBN 0 901158 05 4.

This is a second edition of *British Herbaria*, compiled by Mr Kent and published in 1958. The general arrangement is similar to the earlier work, reviewed in *The London Naturalist* No. 37, but the content is very much larger. The intricately cross-referenced indexes of the new work make it an invaluable source of information for researchers into all aspects of the biography of British botanists and the flora of the British Isles, provided they can work out the meanings of the symbols employed. For instance, one can see that Mr Kent's own private collection was started in 1944 and consists largely of specimens from Surrey and Middlesex, though there are also Middlesex plants gathered by him at the Natural History Museum and at Kew. Mr Allen's own collection is mostly from Hampshire, but he also has a special interest in brambles. He has not kept his specimens from the Isle of Man, but has given them to the same Museum and also to the Botany School at Cambridge and the Manx Museum and Art Gallery, except for those collected in 1962 which are at the National Museum of Wales. The serious student of British brambles will need this book to locate the herbaria of over 50 other collectors. This book will tell you where they all are, unless they have since been lost or destroyed. Tracking down historical specimens is not easy, but *British and Irish herbaria* is a great help. Enquirers wanting to see specimens shown in the literature as being in the herbarium of the London Natural History Society are told that 800 of its specimens were donated to the Natural History Museum in 1938 followed by 2,200 in 1963 and that the remainder are now at the South London Botanical Institute.

R. M. BURTON

# The Fungi of Southern Epping Forest

by C. W. PLANT* and G. KIBBY**

## Summary

A survey of the fungi of Epping Forest made between 1979 and 1983 was concerned principally with the larger species that comprise the Basidiomycotina and the Ascomycotina. The majority of the records given in the species list were gathered during the last three years of the study period. For completeness we have included also the well-documented Myxomycota, although these were not examined during the present survey.

## Introduction

A survey of the higher plant flora of southern Epping Forest has already been published in four parts by Ferris (1980, 1981, 1982, 1983). This work divided the region into four separate recording areas, namely Wanstead Park, Wanstead Flats with Bush Wood, Leyton Flats and Gilbert's Slade with Rising Sun Woods. For the purpose of the present work on the fungal flora of the same area, we have maintained Ferris' divisions with one modification: because of major habitat differences we have separated Wanstead Flats and Bush Wood into two discrete areas. A map of the whole study area was presented by Ferris in the first part of his work (1980, Fig. 1), whilst more detailed maps of each area were produced in the relevant parts of the work. It is considered unnecessary to reproduce those maps here, since we would in any event refer readers to the higher plant flora for detailed descriptions of the habitats.

However, it should be stated that the area is essentially all land that is a part of Epping Forest, south of the Waterworks Corner roundabout on the North Circular Road at O.S. grid reference TQ 394904, with the exception of the small mown area at Wanstead known as George Green.

## Background

### BASIDIOMYCOTINA and ASCOMYCOTINA

**Basidiomycotina**

The earliest published work relating specifically to the fungi of Epping Forest was that of Cooke (1889), who listed a total of 539 species plus 15 varieties, of which the bulk were Basidiomycetes. Localities were given for every record, but none relate to the present study area.

Some forty years later, Ramsbottom (1932) drew together a great many, largely unpublished, records of fungi from all over Essex, including those of James Sowerby whose 'Coloured Plates of British Fungi' started to appear in monthly parts in 1797, and of Edward Forster (1765-1849). Ten of these records can be related specifically to the present study area, although with one exception they cannot be allocated to any of the regions we have adopted for this work. These records are of sufficient interest, and are sufficiently few in number to list in the text at this point:

(a) From James Sowerby's drawings at the British Museum (Natural History), some unpublished, the following records relate to 'Wanstead.' The nomenclature has been updated in accordance with the cited works:

*Passmore Edwards Museum, Romford Road, London E15 4LZ.
**P.O. Box 291, Main Street, Oldwick, New Jersey 08858, U.S.A.

*Clitocybe phyllophila*
*Pholiota squarrosa*
*Gymnopilus spectabilis*
*Kuehneromyces mutabilis*
*Conocybe tenera (?)*
*Agaricus campestris*
*Aleuria aurantia*

(b) From James Sowerby's 'Illustrated English Fungi':
*Auriscalpium vulgare* by the Snaresbrook Pond, Wanstead (= Eagle Pond).

(c) From the notebook of Edward Forster:
*Hydnum erinaceus* (=*Hericium erinaceus*). On a poplar in the Forest between Wanstead and Leytonstone.

(d) Other records:
*Peziza radiculata* (=*Sowerbyella radiculata*). Found in a garden at Wanstead — 13 October 1794.

The earliest twentieth century work on Essex fungi was that of Shenstone (1903). His list in the *Victoria County History of Essex* noted 406 hymenomycetous fungi in Epping Forest, and he compared this to the then accepted British total of 1,338 species. Precise locality data were not given however.

Thirty five years later, Pearson (1938) summarised all of the early Basidiomycete records that he could find together with several of his own, and recorded a revised total of 729 species in the Forest as a whole. More recently, Boardman (1970), revised this again to bring the total up to 784, whilst Kibby (1981) published a list of 97 additions to the Forest list, making the total number of Basidiomycete fungi in the whole of Epping Forest up to 881 species. A further 20 or so species have been added since that date.

**Ascomycotina**

The earliest published data relating specifically to the Ascomycotina of Epping Forest would appear to be the work on discomycetes in Essex by Cooke (1888). Of the 56 species which he listed for the county, no fewer than 49 were recorded from Epping Forest, although most were lacking in more precise locality data. Nearly sixty years elapsed before the next major work on Essex discomycetes was published (Graddon 1946a). Of the 134 species listed in this work, originally read to the Essex Field Club in January 1940, 102 were Epping Forest records, including one, *Pseudotis radiculata* (Sow.) Boud., from 'Wanstead.' Graddon also added a further two species of discomycete, both new to Essex, to the Forest list in 1943 (Graddon 1946b), but neither was from the present study area. The most recent work on the Ascomycotina of Essex, that of Wilberforce (1971), deals solely with Epping Forest relying predominantly on Graddon's records, listing 166 species with no locality data. The total of 20 species recorded in the present work therefore represents 12% of the total Forest list. This compares with a figure of 29% for the Basidiomycetes.

The fungus forays of the Essex Field Club (the first was on 2 October 1880), and the British Mycological Society (the first was in October 1906), which are held every year, usually take place in the central part of the Forest proper. This regularity of records from the richest areas of the Forest means that the list of fungi, including ascomycetes, has steadily risen to about 1,100, and more are added every year. Compared to this, the records in the southern areas were sparse in the extreme, having reached their present level of about 280 species only through active attention by the present authors during the last three years.

The apparently poor flora compared to the rest of the Forest can be explained as follows:

1. The diversity of habitat types and mycorrhizal hosts available to fungi is greater in the Forest as a whole than it is in just the southern tip.
2. In general, mycologists have therefore neglected the southern reaches of the Forest in favour of the greater expanses of woodland to the north with their correspondingly more fruitful returns.
3. Published records from the Forest are rarely accompanied by locality data, and

therefore whilst many of the records on the Forest list may have been obtained from the southern areas, we are unable to discern these.

4. Owing to the great public pressures on the study area for recreational purposes, many collections have been rendered unidentifiable by trampling.

Closer examination however, shows that the extensive grasslands, large numbers of mature oaks and the rich pond margins fringed with *Salix,* have their own rich fungal flora. This flora is composed of species often unknown or very scarce in the Forest proper. Grassland species are particularly well represented, whereas in the large woodlands such species are often confined to the grassy roadsides.

Critical comparison of the papers by Pearson and Boardman quickly reveals that although the latter author made a number of additions by way of species not seen by Pearson, she also failed to find a number that he did record. There are various reasons for this apparent loss of species from the flora. Some undoubtedly were no longer present, and indeed are still apparently absent up to 1983. Examples include *Battaraea phalloides, Queletia mirabilis* and *Tulostoma brumalis.*

However, much confusion is likely to have arisen from the jungle that is fungal nomenclature. Confusion over names and mis-identifications doubtless both occurred, and in the apparent absence of any voucher specimens from either author, none of this can be put to order. Boardman made an impressive collection of photographic slides of fungi, but we have not been able to locate this collection and in any case its value in the identification of many species would be limited.

To add to the confusion, the modern phenomenon of new species being segregated from existing collective taxa largely on microscopic characters has resulted in the necessity of microscopic examination of most fruit bodies prior to identification. As a result, a number of new names have been added to the Forest list in several genera. *Stropharia aeruginosa,* for example, once considered an ubiquitous, easily determined species, is now known to be rather uncommon, whilst one of its 'twins', *Stropharia cyanea,* is by far the most common of the 'green' Strophariae. *Stropharia pseudocyanea* (=*albocyanea*) a third member of this group, is also probably very common, but is extremely difficult to detect growing in the depth of large grass tussocks. In the boletes, the genus *Leccinum* has provided the most recent example of this trend, with *L. scabrum* being split into about five or more taxa, of which four have been found in the present study area. The many wet hollows filled with birches on Leyton Flats are a rich source of these species. No doubt as further research is carried out into other such common and variable species, yet more names will be added to the list in other genera.

The mycological flora of southern Epping Forest has still only begun to be explored. Whole groups of fungi and specialised habitats remain to be examined. Although we must admit that our knowledge of the ascomycete fungi is limited, and that this group has not been thoroughly worked in the study area, we feel that it is fair to say that all of the larger, easily spotted species that have been encountered during our various forays have been accounted for in the list. It is on the smaller, less obvious species that work particularly needs to be done, and we would welcome any contributions in this respect. Many agaric genera such as *Psathyrella, Mycena* and *Coprinus* are also in need of detailed study. Such studies are handicapped by the paucity of mycologists in the area, and of course records tend to reflect the particular interests of the mycologists concerned.

It is a mistake, of course, to think that a finite total is to be reached at some future date. The area is constantly changing, as are the fungi in it. *Gymnopilus decipiens,* for example, originally described from Epping Forest in 1869, appeared in thousands on Leyton Flats during 1977, a year after the extreme drought and subsequent fires which swept the area, but has not been seen since. Although a point will be reached of course when further records will become increasingly difficult to add, such a point is, as yet, a long way off.

**Myxomycota**

During the present survey we have not examined the myxomycete flora, nor was it our intention to do so. However, the occurrence of these strange organisms in southern Epping Forest is fairly well documented, although the records are rather scattered and in part unpublished.

We are fortunate in that Miss Gulielma Lister, who was the acknowledged expert on the group in her day, like her father Arthur Lister before her, resided at Leytonstone, and from here made numerous excursions into the southern part of Epping Forest, particularly Wanstead Park. It is from this latter locality that many species were described for the first time by one or other of these two. Her classic work on the Essex Mycetozoa (Lister 1918) listed 18 species from Epping Forest as a whole, of which fourteen are noted as specifically occurring in Wanstead Park. The overall total for this area might have been greater since she failed to give locality data for every record; for example, the record of *Didymium difforme* mentioned in Ross (1941) for Bush Wood is not noted, nor indeed is her own specimen of this from Wanstead Park, now at the Passmore Edwards Museum.

A few other records have been gleaned from her father's *A Monograph of the Mycetozoa* (Lister 1894), which was subsequently revised by her first in 1911 and again in 1925.

In addition to these sources of information, Miss Lister's collection of slime moulds is housed, in part, at the Passmore Edwards Museum (including the holotype of *Comatricha fimbriata* G. Lister & Cran.), although her other types are thought to be at the B.M (N.H). From these we can add 35 species to the list for southern Epping Forest, making a total of 49. The more recent work on Epping Forest's Myxomycota (Ward 1971), is a compilation of all the records available to him at that time, but regrettably no localities are cited, nor are the dates of specific collections given, although the source of each record is noted. His list includes 107 species, plus 27 varieties. All of the species recorded by Lister (1918) are also included in Ward's work, and no new species have come to light since. None of the myxomycete specimens in Ward's herbarium at the Passmore Edwards Museum can be related to the present study area.

The list of southern Epping Forest myxomycetes is therefore little more than a compilation of all the available data for the area, and is presented here merely for the sake of completing the picture of the known mycology of southern Epping Forest. Forty-four per cent of the Epping Forest Myxomycota listed by Ward have occurred in southern Epping Forest.

## Brief Descriptions of the Recording Areas

**Wanstead Park**

Although not particularly large, and much of it seemingly unsuitable for the production of fungi, Wanstead Park has proved to be a continual source of new and rare species, with eight of the total 162 species recorded being new Essex records. These eight are *Pluteus aurantiorugosus*, *Agaricus squamuliferus*, *A. variegans*, *Psilocybe cyanescens*, *Cortinarius turmalis*, *Polyporus rostkovii*, *Boletus ambiguus nom. prov.*, and *Peziza proteana* (including var. *sparassoides*).

The difference in the fungal flora of this area and that of the remainder of southern Epping Forest is, however, quite marked. There are no large numbers of *Boletus*, *Russula*, *Cortinarius* or *Amanita* so typical of mature woodlands, and perhaps the only really well represented genera are *Pluteus*, with eight species, and *Agaricus*, with the same number. The vivid flame orange *Pluteus aurantiorugosus* was found on an elm stump in the early 1970s but has apparently not fruited since.

The uncommon *Agaricus vaporarius* on the other hand occurs annually, in quantity, whilst the much rarer *A. variegans* continues to thrive in a small grassy

area in the Park. The equally rare *A. squamuliferus* was recorded once only in 1979 on Lincoln Island in the Ornamental Water.

The blue staining *Psilocybe cyanescens* was located on a woodpile during 1981, and was still there in 1982, although it did not appear the next year. *Melanoleuca strictipes* is a white species to be found in the spring; and *Agrocybe dura* is another vernal species to be found here. In spite of the major changes which have taken place in Wanstead Park in recent years, such as the clear-felling of much of The Grove and Warren Wood, and the associated disturbance of the soil by machinery, there are without doubt more interesting species to be found there, particularly the vernal species which are not as well recorded as those of the autumn period.

**Wanstead Flats**

The bulk of Wanstead Flats comprises large areas of mown grass used as football pitches, which consequently have little to offer in the way of fungi. In fact this area is generally poor on fungi, with only 69 species and one variety present, although one of these, *Hebeloma leucosarx,* is a new county record. The short grass areas around the football pitches have produced *Camarophyllus (=Hygrocybe) russocoriaceus* and species of *Agaricus,* as well as common species such as *Marasmius oreades* and *Psilocybe semilanceata.* The longer grass areas around these pitches are marginally richer, and in particular produce *Leucopaxillus giganteus,* which is also present in Wanstead Park. This species tends to have a northerly distribution in Britain. The small copses of trees are poor in fungal variety. *Fistulina hepatica* occurs sparingly, whilst *Lactarius necator (=turpis)* is the only member of the Russulaceae present. The Boletaceae too are represented by a single species, *Boletus subtomentosus,* which occurs in one small area. *Lepista nuda* can be found in some areas under the trees. True lignicolous species are generally absent, as the exposed nature of the site allows the wind to dry out any dead wood which may remain *in situ* long enough for such species to establish. The roadside margins produce *Volvariella speciosa,* and 1983 was a particularly good year for this normally uncommon species. Such locations also produce *Agaricus vaporarius,* and *Langermannia gigantea,* whilst the adjacent damp ditches produce *Rickenella (=Omphalina) fibula* and *Omphalina ericetorum.* The short turf on gravel around the Alexander Lake also produces an annual crop of *Hygrocybe miniata,* whose bright red colouration is visible at some distance.

**Bush Wood**

We have been very precise in our definition of Bush Wood. The only grassland included that is not wholly enclosed by trees lies in the north-east corner around the Forest Keeper's cottage. The strip of grassland running from Bush Road in the north to Wanstead Flats in the south, along the western edge of Bush Wood proper, has been included under Wanstead Flats in this work. In addition, we have extended no further southwards beyond the tree-line of Bush Wood than we considered necessary to find species growing in association with tree roots. Any purely grassland species growing in this area beyond the tree-line have been listed under Wanstead Flats. The grassy area around the trees that form the historic Evelyn's Avenue within Bush Wood has, however, been included under the present heading.

Within this strictly defined area we have discovered a surprisingly poor fungal flora, with only 92 species and one variety being noted. The presence of nine species of *Russula* together with three *Lactarius* and four *Boletus* indicates the character of this woodland area. It is a mature oak/hornbeam wood, largely un-pollarded, with several mature sweet chestnut, beech, horse-chestnut and others. The margin of Blake Hall Road is lined with London plane and there is much bracken along this eastern edge. Typical woodland species of fungi such as *Collybia peronata* occur, as does *Cortinarius trivialis,* another species new to

Essex; in addition there are two species of *Hebeloma* that we have been able to positively determine, these being *H. crustuliniforme* and *H. mesophaeum*. *Amanita spissa* is also present; this appears to be an uncommon fungus in the study area as a whole. *Agaricus arvensis* and *A. vaporarius* are not typical of woodlands, but nevertheless occur in suitable localities. The central area of Bush Wood, near to the Society of Friends Meeting House, contains a small semi-permanent pond, and in the damp margin of this we have found a *Hypholoma* and a *Tubaria* species which we have not yet been able to determine. Finally, *Phallus impudicus*, the stink-horn fungus, so often located by smell rather than vision, has been growing in Bush Wood, the only other locality in the southern part of Epping Forest apparently being Wanstead Park.

**Leyton Flats**

From the mycologists viewpoint this is by far the most interesting area of southern Epping Forest, and in some respects is far superior to parts of the Forest proper, even though the total of 152 species recorded is slightly lower than that for Wanstead Park. It is the quality of the species that provides the attraction, with no less than 13 new Essex records, including two extreme rarities, and a host of rare and uncommon species besides. For the purpose of this brief description, it is desirable to divide Leyton Flats into four smaller parts, each differing in character:

1. James Lane Area: This is the strip of woodland to the south of Whipps Cross (=North Circular) Road, separated by this road from the rest of Leyton Flats. Typical woodland species such as several of those found in Bush Wood can also be found here, including *Collybia erythropus, C. peronata, Russula atropurpurea* and *Lactarius quietus*. Less common amongst the Agaricales here is *Macrolepiota gracilenta*, whilst the Boletales include *Boletus armeniacus* (first Essex record) found during 1976. Present day Gasteromycetes include *Lycoperdon foetidum, Calvatia excipuliforme, Bovista plumbea* and *Vascellum pratense*, whilst the historical records include *Geaster bryantii* in 1946.

2. Grassland Areas: These comprise the bulk of Leyton Flats and are composed mainly of areas of short turf, although tall grasses are present in certain areas. Although poor in quantity of fungi, this habitat has produced some of the most interesting species. The rare *Agaricus comtulus* grows in the extremely short, almost non-existent turf in the eastern half of the Flats, whilst not far away are the even rarer *Agaricus lutosus* and *A. impudicus*, both new to Essex during this survey. In the longer grasses that fringe the mown areas we found *Stropharia inuncta* during 1982, and during 1983 *Hygrophoropsis pallida* was located at the eastern edge of the Flats near some gorse bushes. The occurrence of *Gymnopilus decipiens* on the burnt grassland area during 1977 has also been mentioned. The extreme south-east tip of Leyton Flats is crossed by London Transport's Central Line Railway, and on the damp clay soil of the northern embankment here are *Stropharia aeruginosa, S. cyanea* and *S. albocyanea* within a short distance of each other. *Vascellum pratense* and *Bovista plumbea* are also present on this bank, and during 1983 we found *Clavaria vermicularis*.

3. Woodland Areas: In this we include the trees around the Hollow Ponds, standing on gravel which is bare as a result of erosion by human feet and motorcycles, and the woodland areas that are continuous with these along the northern edge of the Flats as far as the Eagle Pond at Snaresbrook. Most of the expected common species are present here. Ten species of *Russula* and six *Lactarius* make this the best part of the study area for the Russulaceae, whilst the Boletaceae are represented by eight species including *Boletus versicolor*. Amongst the other Basidiomycetes *Tricholoma fulvum, T. sulphureum* and *T. ustaloides* all deserve mention, whilst growing along Whipps Cross Road is *Lepista irina*. North of the Hollow Ponds a new Essex record is provided by *Cortinarius baslilaceus* sp. nov. (in press), (see Orton 1984), whilst from a

clearing in the trees we have *Macrolepiota konradii* and a further two collections of *Macrolepiota* as yet undetermined.

4. SALIX SWAMP AREA: To the north of the open-air swimming pool on Leyton Flats is a largish area of more or less permanent water (although this did dry out during 1976 and again, partly, during 1983), in which the dominant higher plant vegetation comprises rushes *Juncus* spp. and other aquatic species. The bulk of this area is surrounded by *Salix,* with birches at intervals, and these grow out into the marsh area and spread by rooting from the branches. It is under these bushes that *Russula laccata* (=*R. olivaceoviolascens sensu* Moser) grows in great profusion, its bright red, glossy pileus making it an easily found species. This is the only Essex locality for this extremely rare fungus, which was present during 1981 and 1982. Its apparent lack of fruiting bodies during 1983 was no doubt due to the dry weather of that year, and we have high hopes that it will reappear in 1984 during October. In greater quantity than the *Russula* however, and growing alongside it we found *Dermocybe cinnamomeolutea,* a member of the *Cortinarius* supergenus and a rare species indeed, this being the only Essex locality for the species. Other Cortinariaceae present in the same area are *Cortinarius basililaceus* and *Naucoria bohemica,* whilst in the moss carpet that dominates much of the edge of the marsh area *Hypholoma elongatum* grows in profusion along with *H. ericaeum.* On the drier areas immediately around the edge of this moss carpet the gasteromycete fungi *Scleroderma cepa* and *S. verrucosum* are both to be found along with the more common earth-ball *S. citrinum.*

**Gilbert's Slade and Rising Sun Woods**

This last area is simply divided. Gilbert's Slade is the area to the east of the Woodford New Road, whilst the trees to the west are called by us Rising Sun Woods after the Public House of that name in their midst. The fungal flora of each is not markedly different, and we therefore lump all the records for these two areas together as one. With only 86 species noted by us, this must rank as the worst-recorded area of southern Epping Forest, and perhaps we are directly to blame for this in that we have tended to concentrate our efforts in other areas. Ten species of *Russula,* three *Lactarius* and four *Boletus* however, serve to demonstrate the rich potential of this mature woodland. There are no new county records and no species of particular noteworthiness listed by us from this area, and the only species recorded here that was not found elsewhere in the study area was *Lepista saeva.*

## SPECIES LIST

The sequence of families and genera adopted here follows Kibby (1979, p.30). In deciding upon which nomenclature to follow we have encountered a few problems, although we do not feel that it is necessary to expand upon these here. In general, the following reference works have been followed:

| | |
|---|---|
| Myxomycota | Ing (1968) |
| Ascomycotina | Dennis (1978) |
| Agaricales | Moser (1983) |
| Boletales | Watling *et al.* (1969) |
| Aphyllophorales | Pegler (1973) |
| Gasteromycetes | Demoulin and Marriot (1981) |
| Auriculariales, Dacrymycetales | Watling (1973) |

It is appropriate at this point to state the whereabouts of the voucher specimens obtained during this work. We have endeavoured to keep samples of all collections wherever possible, although we have not always been as successful as we had hoped. The bulk of the specimens which do exist, which accounts for about 95% of the species recorded, are housed at the Passmore Edwards

Museum. Nearly all of these, including the common species, have been freeze-dried, a process which allows retention of the superficial morphological characteristics of the fungus, and incorporated into the systematic collection in the herbarium. A very small number have been air dried in the traditional manner. A lesser number of specimens, including many of the noteworthy species are in Herb. Roger Phillips. These are all air dried, but have all been photographed by Phillips for possible inclusion in a future companion volume to Phillips (1981).

The following abbreviations have been used in the list of Basidiomycetes:

| | |
|---|---|
| NCR | New County Record (for Essex) |
| A | Wanstead Park |
| B | Wanstead Flats |
| C | Bush Wood |
| D | Leyton Flats |
| E | Gilbert's Slade and Rising Sun Woods |
| T | Throughout, implying that the species is present in each of the areas A to E and is common |

Details in the lists of Myxomycota and Ascomycotina are given in full.

## MYXOMYCOTA

The following are entirely historical records, but the nomenclature has been updated in accordance with the cited references.

### LICEALES

RETICULARIACEAE

| | |
|---|---|
| *Lycogala epidendrum* (L.) Fr. | Leytonstone – July 1895. |
| *Reticularis lobata* Lister | Wanstead Park – July 1889. |
| *R. olivacea* (Enrenb.) Fr. | Leytonstone – November 1906. |
| *R. lycoperdon* Bull. | Leytonstone – October 1894. |

CRIBRARIACEAE

| | |
|---|---|
| *Cribraris argillacea* (Pers.) Pers. | Wanstead Park – July 1889. |
| *C. aurantiaca* Schrader | Leytonstone – August 1897. |
| *C. cancellata* (Batsch) Nann. -Brem. | Wanstead Park – July 1888. |

### TRICHIALES

TRICHIACAE

| | |
|---|---|
| *Perichaena corticalis* (Batsch) Rostaf. | Leytonstone – October 1911. |
| *Arcyria cinerea/carnea* (label *A. cinerea* (Bull) Pers. var. *carnea* Lister) | Wanstead Park – undated specimen. |
| *A. ferruginea* Sauter | Leytonstone – November 1896. |
| *A. nutans* (Bull.) Greville | Wanstead Park – undated specimen. |
| *Metatrichium vesparium* (Batsch) Nann. -Brem. | Wanstead Park – February 1887. |
| *Hemitrichia leiotricha* (Lister) G. Lister | Wanstead Park – November 1896. |
| *Trichia botytris* (Gmel.) Pers. | Wanstead Park – February 1888. |
| *T. contorta* (Ditm.) Rostaf. | Leytonstone – undated specimen. |
| *T. decipiens* (Pers.) Macbr. | Wanstead Park – March 1889. |
| *T. affinis* de Barry. | Wanstead Park – March 1892. |
| *T. persimilis* Karst. | Wanstead Park – 'August'. |
| *T. varia* (Pers.) Pers. | Wanstead Park – December 1893. |

### STEMONITALES

STEMONITACEAE

| | |
|---|---|
| *Brefeldia maxima* (Fr.) Rostaf. | Wanstead Park – November 1906. |
| *Stemonitis axifera* (Bull.) Macbr. | Gilbert's Slade – September 1892. |
| *S. fusca* Roth var. *confluenca* Lister | Wanstead Park – July 1891. |
| *Comatricha nigra* (Pers.) Schroeter | Leytonstone – December 1898. |
| *C. pulchella* (Bab.) Rostaf. var. *nigra* Lister | Wanstead Park – October 1896. |

| | |
|---|---|
| *C. typhoides* (Bull.) var. *microspora* Lister. | Wanstead Park – October 1906. |
| *Paradiacheopsis fimbriata* (G. List. & Cran.) Hertel | Wanstead Park 1913. Holotype (label *Comatricha fimbriata* G. Lister & Cran.). |
| *Diachea leucopodia* (Bull.) Rostaf. | Wanstead Park – August 1888. |

PHYSARALES

PHYSARACEAE

| | |
|---|---|
| *Badhamia foliicolor* Lister | Wanstead Park – September 1896. |
| *B. macrocarpa* (Cesati) Rostaf. | Wanstead Park – Ocober 1911. |
| *B. panicea* (Fr.) Rostaf. | Wanstead Park – October 1911. |
| *B. populina* A. & G. Lister | Leytonstone – November 1903. |
| *Physarum bitectum* G. Lister | Wanstead Park – November 1896. |
| *P. bivalve* Pers. | Wanstead Park – November 1896. |
| *P. cinereum* (Batsch) Pers. | Wanstead Park – July 1890. |
| *P. compressum* Alb. & Sch. | Wanstead Park – November 1902. |
| *P. pusillum* (Berk. & Curt.) G. Lister | Wanstead Park – October 1904. |
| *P. vernum* Sommerf. ex Fr. var. *irridescens* Lister | Wanstead Park – November 1896. |
| *P. virescens* Ditm. | Leytonstone Forest – no date. |
| *P. viride* (Bull.) Pers. | Wanstead Park – October 1887. |
| *Craterium leucocephalum* (Pers.) Ditm. | Wanstead Park – October 1898. |
| *C. minutum* (Leers) Fr. | Leytonstone – October 1896. |

DIDYMIACEAE

| | |
|---|---|
| *Diderma effusum* (Schw.) Morgan | Leytonstone – July 1910. |
| *D. spumarioides* (Fr.) Fr. | Wanstead Park – August 1888. |
| *Didymium anellus* Morgan. | Wanstead Park – November 1898. |
| *D. clavus* (Alb. & Schw.) Rabenh. | Wanstead Park – November 1896. |
| *D. difforma* (Pers.) S.F. Gray | Wanstead Park – November 1896. |
| | Bush Wood – no date. |
| *D. nigripes* (Link) Fr. | Wanstead Park – July 1894. |
| *D. nigripes* (Link) Fr. var. *xanthopus* Lister | Wanstead Park – July 1894. |
| *D. squamulosum* (Alb. & Schw.) Fr. | Wanstead Park – August 1888. |

## EUMYCOTA

Records gathered between 1970 and 1983.

***ASCOMYCOTINA***

*DISCOMYCETES*

PEZIZALES

HELVELLACEAE

| | |
|---|---|
| *Tarzeta catinus* (Holmskjold ex Fr.) Korf. & Rogers | Wanstead Park – October 1979. |

PEZIZACEAE

| | |
|---|---|
| *Peziza repanda* Pers. | Wanstead Flats – November 1979. |
| *P. varia* (Hedwig.) Fr. | Wanstead Park – 1974. |
| *P. emileia* Cooke. | Wanstead Park – 1974. |
| *P. succosa* Berkeley. | Wanstead Park – 1974. |
| *P. proteana* (Boud.) Seaver:NCR. | Wanstead Park – 20 September 1979. |
| *P. proteana* (Boud.) Seaver, forma *sparassoides* (Boud.) Korf. | Wanstead Park – 20 September 1979. |

HUMARIACEAE

| | |
|---|---|
| *Aleuria aurantia* (Fr.) Fuckel. | Warren Wood, Wanstead Park — October 1979. The woodland floor was covered in places with this fungus. Not recorded here since. |
| | City of London Cemetery, on a lawn — December 1979. |
| *Scutellinia scutellata* (L. ex St. Amans) Lambotte. | On a log by Perch Pond, Wanstead Park – 1979. |

| | |
|---|---|
| *Coprobia granulata* (Bull. ex Fr.) Boudier. | Abundant on cow dung in all areas. |
| HELIOTALES | |
| HELIOTACEAE | |
| *Coryne sarcoides* (Jacquin ex Fr.) Tul. | Recorded all areas except Wanstead Flats. Common. |
| *Hymenoscyphus calyculus* (Sow ex Fr.) Phillips | On trees throughout Wanstead Park and Gilbert's Slade, but not common. |
| GEOGLOSSACEAE | |
| *Geoglossum fallax* Durand | Wanstead Park – October 1980. Rare – known from this single collection only. |
| CLAVICIPITALES | |
| *Claviceps purpurea* (Fr.) Tul. | Recorded in all areas sparingly. |
| *PYRENOMYCETES* | |
| SPHAERIALES | |
| XYLARIACEAE | |
| *Hypoxylon fragiforme* (Pers. ex Fr.) Kickx. | Plentiful in all areas. |
| *Daldinia concentrica* (Bolt. ex Fr.) Cesati & de Not. | On birches throughout the area. Common. |
| *Xylosphaeria hypoxylon* (L.) Dum. | Recorded all areas. Common. |
| *X. longipes* (Nitschke) Dennis. | Wanstead Park, near Ornamental Water – September 1980. Known only from this collection. |
| *X. polymorpha* (Pers. ex Merat) Dum. | Wanstead Park, Leyton Flats and Wanstead Sewage Works. Common where it occurs. |
| DIATRYPACEAE | |
| *Diatrype disciformis* (Hoffm. ex Fr.) Fr. | Wanstead Flats – 1979. |
| HYPOCREACEAE | |
| *Nectria cinnabarina* (Tode ex. Fr.) Fr. | Abundant in all areas. |
| ***BASIDIOMYCOTINA*** | |
| *HOLOBASIDIOMYCETES* | |
| AGARICALES | |
| AMANITACEAE | |
| *Amanita citrina* (Schaeff.) S. F. Gray | D, E. Common |
| *A. citrina* var. *alba* Gillet | E. Apparently in one locality only. |
| *A. fulva* (Schaeff.) Secr. | C, D. Uncommon. |
| *A. muscaria* (L. ex Fr.) Hooker | A, B, D. Common. |
| *A. rubescens* (Pers. Fr.) S. F. Gray | A, C, D, E. Abundant. |
| *A. spissa* (Fr.) Kummer | C, D. Uncommon. |
| VOLVARIACEAE | |
| *Pluteus cervinus* (Schaeff. ex Fr.) Kummer, (=*P. atricapillus* (Secr.) Sing.) | A, C, D, E. Common. |
| *P. umbrosus* (Pers. ex Fr.) Kummer | A – 1974. Not recorded since. |
| *P. aurantiorugusus* (Trog.) Sacc. | NCR, A – 1974 and 1979 only. |
| *P. griseopus* P. D. Orton. | A – 1974 only. |
| *P. nanus* (Pers. ex Fr.) Kummer | A – 1974 only. |
| *P. olivaceus* P. D. Orton. | A, E. Common. |
| *P. podospileus* Sacc. & Cub. | A – 1974 only. |
| *P. semibulbosus* (Lasch. ap Fr.) Gill. | A – 1974 only. |
| *Volvariella speciosa* (Fr. ex Fr.) Sing. | B, C, D. Normally uncommon, but fruiting bodies produced in profusion in 1983. |

LEPIOTACEAE (= AGARICACEAE ss. Moser – part)

| | |
|---|---|
| *Lepiota cristata* Kummer | B, D. Common. |
| *Lepiota (=Cystolepiota) sistrata* (Fr.) Quél. | A. Uncommon. |
| *Lepiota naucina* (Fr.) Kummer (= *Leucoagaricus cretaceus* (Bull. ss. Locq.)) | A. Uncommon. |
| *Macrolepiota procera* (Scop. ex Fr.) S. F. Gray | A, C, E. Common. |
| *M. rhacodes* (Vitt.) Quél. | A, B, E. Common. |
| var. *hortensis* Pilat. | A. Uncommon. Also at Wanstead Sewage Works. |
| *M. konradii* (Huijsm. ex P. D. Orton) Moser. | E. Rare. |
| *M. gracilenta* (Fr.) | A – 1974. E – 1978. Rare. |
| *Macrolepiota* sp. indet. | E. Two collections. |

AGARICACEAE

**Section Edules**

| | |
|---|---|
| *Agaricus bitorquis* (Quél.) Sacc. | E. On Green Man Roundabout – 1983. Rare. |

**Section Rubescentes**

| | |
|---|---|
| *Agaricus squamuliferus* (Moell.) Moell. | A. Lincoln Island – 1979. Rare. Known from a single collection only. |
| *A. haemorrhoidarius* Kalchbr. & Schulz. (incl. specimens identified earlier as *A. silvaticus* Schaeff. ex Secr.) | A, B, D. Uncommon. |
| *A. variegans* Moell. | NCR. A. Known from one site only in low numbers. |
| *A. impudicus* (Rea). | NCR. E. September 1979. Rare. |
| *A. vaporarius* (Vitt.) Moser | A, B, C and Wanstead Sewage Works. Common. |
| *A. campestris* L. ex Fr. | A, B, D, E. Common. |
| *A. augustus* Fr. | A. Common. |
| *A. silvicola* (Vitt.) Sacc. | A. Uncommon. |
| *A. arvensis* (Schaeff. ex Secr.) Langc | B, C and Wanstead Sewage Works. Common. |

**Section Minores**

| | |
|---|---|
| *Agaricus comtulus* Fr. | E. Very rare. |
| *A. lutosus* (Moell.) Moell. | NCR. E. Very rare. |
| *A. xanthodermus* Genevier | A. Common. |

COPRINACEAE

| | |
|---|---|
| *Coprinus comatus* (Mull. ex Fr.) S. F. Gray | A. Surprisingly not recorded in areas B to E, although it is present in both the Wanstead Sewage Works and the City of London Cemetery. |
| *C. atramentarius* (Bull. ex Fr.) Fr. | A, E. Common where it occurs. |
| *C. cinereus* (Schaeff. ex Fr.) S. F. Gray | A. Common. |
| *C. micaceus* (Bull. ex Fr.) Fr. | A, B, C, E. This in the segregate; the aggregate is present in all five areas. |
| *C. domesticus* (Bolt ex Fr.) S. F. Gray | D. Under recorded. |
| *C. disseminatus* (Pers. ex Fr.) S. F. Gray | A. Recorded in 1979 only. Probably under recorded although it is an easily determined species. |
| *C. plicatilis* (Curt. ex Fr.) Fr. | B, D. Probably under recorded. |
| *Panaeolus rickenii* Hora | A, D, E. Common. Probably overlooked on B. |
| *P. sphinctrinus* (Fr.) Quél. | B. Common on cow dung, probably overlooked in the other areas. |
| *Panaeolina foenisecii* (Pers. ex Fr.) Maire | B, C, E. Common. |
| *Anellaria semiovata* (Sow. ex Fr.) Pears. & Dennis | B. Probably overlooked. |

| | |
|---|---|
| *Psathyrella candolleana* (Fr.) Maire | Only recorded in the City of London Cemetery. There is no reason however, why it should not occur in the adjacent areas of A and B, and is probably overlooked. |
| *P. conopilea* (Fr.) Pears & Dennis | A. Under recorded. |
| *P. gracilis* (Fr.) Quél. | B. Under recorded. |
| *P. hydrophilia* (Bull. ex Merat) Maire | A. Under recorded. |
| *P. multipedata* Peck | B. Under recorded. |
| *P. spadiceogrisea* (Fr.) Maire | A, B, C, D. Common. |
| *Lacrymaria lacrimabunda* auct. non Fr. (=*Psathyrella velutina* (Pers. ex Fr.) Sing sensu Moser) | A, B, D, E. Common. |
| STROPHARIACEAE | |
| *Stropharia inuncta* (Fr.) Quél. | D. Rare. |
| *S. aeruginosa* (Curt. ex Fr.) Quél. | A, C, D. Uncommon. |
| *S. cyanea* (Bolt. ex Secr.) Tuomikoski | B, C, D. Probably overlooked elsewhere. Very common. |
| *S. albocyanea* (Desm.) Quél. Fr. | D. Probably under recorded. Common where it occurs. |
| *S. semiglobata* (Batsch. ex Fr.) Quél. | C, D, E. Common. |
| *S. coronilla* (Bull. ex Fr.) Quél. | Only in Wanstead Sewage Works where it is common. Probably overlooked elsewhere. |
| *Hypholoma elongatum* (Pers. ex Fr.) Ricken. (=*H. elongatipes* ss Moser) | D. Willow swamp area. |
| *H. ericaeum* (Pers. ex Fr.) Sing. | D, E. Uncommon. |
| *H. fasciculare* (Huds. ex Fr.) Kummer | T. Abundant. |
| *H. sublateritium* (Fr.) Quél. | A. Apparently rare. |
| *Hypholoma* sp. indet. | C. A single collection from a damp area in 1983. |
| *Psilocybe cyanescens* Wakefield | NCR. A. Known only from this site. |
| *P. semilanceata* (Fr. ex Secr.) Kummer | A, B, E. Common, abundant some years. |
| *Pholiota alnicola* (Fr.) Sing | A. Uncommon. |
| *P. highlandensis* (Peck) Smith (= *P. carbonaria* (Fr. ex Fr.) Sing ss Moser) | A. Uncommon. |
| *P. gummosa* (Lasch) Sing | A, C and Wanstead Sewage Works. Uncommon. |
| *P. squarrosa* (Mull. ex Fr.) Kummer | A, C. Common. |
| CORTINARIACEAE | |
| *Cortinarius* sp. undescribed | NCR. D. To be published as *C. basiliaceus* by P. Orton during 1984 in *Bull. R. Botan. Gardens Edinburgh.* |
| *C. obtusus* (Fr.) Fr. | D. Rare. |
| *C. trivialis* Lge. | NCR. C. In one area only. Rare. |
| *C. turmalis* (Fr.) | NCR. A. Recorded in 1974. |
| *C. uliginosus* Berk. | D. Numerous fruit bodies in one area only. |
| *C. paleaceus* agg. | D. Uncommon. |
| *Dermocybe cinnamomeolutea* (Orton) Moser | NCR. D. Abundant annually in the swamp area. |
| *Naucoria bohemica* Vel. | D. Recorded twice only. |
| *Tubaria autochthona* (B. & Br.) Sacc (=*T. dispersa* (Pers.) Sing. ss Moser) | B, D. Not common, but possibly overlooked. |
| *T. furfuracea* (Pers. ex Fr.) Gillet | A, B, D. Common. |
| *Tubaria* sp. indet. | C. One collection from a damp area in 1983. |
| *Gymnopilus spectabilis* Fr. (Sing.) (= *G. junonius* Fr. (Orton)) | T. Common. |
| *G. penetrans* (Fr. ex Fr.) Murr. | C, D, E. Common, but less so than *G. spectabilis* |
| *G. decipiens* (W. G. Smith) Orton | D. September 1977 only, the year after the drought and subsequent fires. |
| *Hebeloma crustuliniforme* (Bull. ex St. Amans) Quél. | A, C, D, E. Common. |
| *H. leucosarx* Orton. | B. Rare. |
| *H. longicaudum* (Pers. ex Fr.) Kummer | A. Uncommon. |
| *H. mesophaeum* (Pers.) Quél. | C, D. Uncommon. |

| | |
|---|---|
| *H. populinum* Romagn | NCR. D. Rare. |
| *H. pusillum* Lge. | D. Rare. |
| *H. sacchariolens* Quél. agg. | D. The aggregate is common where it occurs, but we have not yet worked on any segregates. |
| ENTOLOMATACEAE | |
| *Entoloma sericeum* (Bull. ex Merat) Quél. | D. Known only from a single collection in 1979. |
| *E. rhodopolium* (Fr.) Kummer | A. August 1978. |
| *E. icterinum* (Fr.) | A. August 1978. |
| TRICHOLOMATACEAE | |
| **Tribe Tricholomae** | |
| *Tricholoma fulvum* (D. C. ex Fr.) Sacc. (=*T. flavobrunneum* (Fr.) Kummer | D. Rare. |
| *T. ustaloides* Romagn. | D. Rare. |
| *T. sulphureum* (Bull. ex Fr.) Kummer | D. Rare. |
| *Calocybe gambosa* (Fr.) Donk | B, and in the City of London Cemetery. Rare. |
| *Lyophyllum decastes* (Fr. ex Fr.) Sing | B, D. Uncommon. |
| *Melanoleuca melaleuca* (Pers. ex Fr.) Maire | D. Rare. |
| *M. strictipes* (Karst) Murr. | NCR. A. 1974, 1979 and 1980. |
| *M. arcuata* (Fr.) Sing | NCR. D. October 1980. |
| **Tribe Clitocybeae** | |
| *Clitocybe clavipes* (Pers. ex Fr.) Kummer | A, C. Common, probably under recorded. |
| *C. dealbata* (Sow. ex Fr.) Kummer (Here we include *C. rivulosa* (Pers. ex Fr.) Kummer since we have made no attempt to separate these two species) | A, B, C, E. Common. |
| *C. flaccida* (Sow. ex Fr.) Kummer) | A, C. Common where it occurs, but limited in its distribution. |
| *C. nebularis* (Batsch. ex Fr.) Kummer | A, B, C, E. Common. |
| *Leucopaxillus giganteus* (Fr.) Sing | A, B. Also in profusion at St Mary's Churchyard, Wanstead. Common where it occurs, often it is abundant. This is typically a northern species! |
| *Armillaria mellea* (Vahl. ex Fr.) Kummer. | T. Extremely common. |
| *A. bulbosa* (Barla) Romagn | T. Extremely common. |
| *A. mellea* agg. | T. A large number of collections are referable to this aggregate and require further examination to segregate them. |
| *Hygrophoropsis aurantiaca* (Wulf. ex Fr.) Maire | E. Uncommon. |
| *H. pallida* (Peck) Kreisel | NCR. D. A single collection only during 1983. |
| *Laccaria amethystea* (Bull. ex Merat) Murril | D, E. Common. |
| *L. laccata* (Scop. ex Fr.) Cooke | T. Abundant. |
| *L. proxima* (Boud.) Pat. | A, C, D, E. Common in suitable areas. |
| **Tribe Collybiae** | |
| *Collybia butyracea* (Bull. ex Fr.) Kummer. | A, C, E. Common. |
| *C. cookei* (Bres.) J. D. Arnold | A. Uncommon. |
| *C. dryophilia* (Bull. ex Fr.) Kummer var. *aquosa* (Bull. ex Fr.) | A, C, D. Common. D. Uncommon or rare. |
| *C. erythropus* (Pers. ex Fr.) Kummer (=*C. marasmioides* (Britz.) Bresin & Stang.) | A, C, E. Common, and growing with exceptionally long stipe in 1981. |
| *C. fusipes* (Bull. ex Fr.) Quél. | A. Apparently uncommon. |
| *C. peronata* (Bolt. ex Fr.) Kummer | A, C, D. Common. |
| *Oudemansiella radicata* (Relhan. ex Fr.) Sing | A, D. Uncommon. |
| *Flammulina velutipes* (Curt. ex Fr.) Karst | T. Abundant. |

| | |
|---|---|
| *Mycena* (Pers. ex Fr.) S. F. Gray | This is a particularly difficult genus, and one which is much underworked in the study area. We have thus omitted any statements of relative abundance since to make these would merely be speculation. |
| *Mycena alcalina* (Fr. ex Fr.) Kummer | A, D. |
| *M. epipterygia* (Scop. ex Fr.) S. F. Gray | D. |
| *M. flavoalba* (Fr.) Quél. | B, D, and City of London Cemetery. |
| *M. filopes* (Bull. ex Fr.) Kummer | B, E. |
| *M. galericulata* (Scop. ex Fr.) S. F. Gray | T. This species is abundant. |
| *M. galopus* (Pers. ex Fr.) Kummer | T. |
| *var. alba* Rea(=var. *candida* Lge.) | B, C, D. |
| *M. haematopus* (Pers.) Fr. | D, E. |
| *M. inclinata* (Fr.) Quél. | C. |
| *M. leptocephala* (Pers. ex Fr.) Gillet | B, D. |
| *M. leucogala* (Cooke) Sacc. | A, B, C, D. |
| *M. olivaceomarginata* (Massee & Cooke) Massee | B. |
| *M. polygramma* (Bull. ex Fr.) S. F. Gray | Found only in the City of London Cemetery. |
| *M. sanguinolenta* (Alb. & Schw. ex Fr.) Kummer | D. |
| *Omphalina ericetorum* (Fr. ex Fr.) M. Lange | B. |
| *O. fibula* (Bull. ex Fr.) Kuhn | B, D. |
| *Micromphale foetidum* (Sow. ex Fr.) Sing | A. Uncommon. |
| *Marasmius oreades* (Bolt. ex Fr.) Fr. | A, B, D. Common. |
| *M. rotula* (Scop. ex Fr.) Fr. | A. Uncommon. |
| *M. lupuletorum* (Wienm.) Fr. | C. Uncommon. |
| *Marasmiellus ramealis* (Bull. ex Fr.) Sing | A. Uncommon. |
| CLITOPILACEAE | |
| *Clitopilus prunulus* (Scop. ex Fr.) Kummer | D. Uncommon. |
| *Lepista irina* (Fr.) Bigelow | D. A single locality only. |
| *L. nuda* (Bull. ex Fr.) Cooke | A, B, C, E. Common. |
| *L. saeva* (Fr.) Orton | E. Rare. |
| *L. sordida* (Fr.) Sing | A. Also at Wanstead Sewage Works. Uncommon. |
| *Rhodotus palmatus* (Bull. ex Fr.) Maire | A. A single collection in 1982. |
| PLEUROTACEAE | |
| *Pleurotus cornucopiae* Paulet ex Pers. | A. Under recorded. |
| *P. ostreatus* (Jacq.) Fr. Kummer | T. Abundant. |
| *P. pulmonarius* (Fr.) Quél. | A, C, D, E. Abundant. |
| *P. lignatilis* (Pers. ex Fr.) Kummer | A. Rare. |
| *Resupinatus applicatus* (Batsch ex Fr.) S. F. Gray. | A. Under recorded? |
| *Crepidotus mollis* (Schaeff. ex Fr.) Kummer | A. Apparently rare. |
| BOLBITIACEAE | |
| *Bolbitius vitellinus* (Pers. ex Fr.) Fr. | A, D, E. Common. |
| *Conocybe tenera* (Schaeff. ex Fr.) Kuhn | A, B, D, E. Common. |
| *Agrocybe praecox* (Pers. ex Fr.) Fayod | B. Uncommon. |
| *A. paludosa* (Lge.) Kuhn & Romagn | D. Uncommon. |
| *A. dura* (Bolt. ex Fr.) Sing | A. 1974. |
| HYGROPHORACEAE | |
| *Hygrocybe miniata* (Fr.) Kummer | B, C, D. Common. |
| *H. coccinea* (Schaeff. ex Fr.) Kummer | D. 1982 only. |
| *H. (=Camarophyllus) niveus* (Scop.) Fr. | D. 1982 only. |
| *H. (C.) russocoriaceus* Berk & Miller | B. Uncommon. |
| RUSSULACEAE | |
| *Russula aeruginea* Lindblad ex Fr. | C. A single collection in 1979. |
| *R. atropurpurea* (Krombh.) Britz | A, C, D, E. The commonest *Russula* herc. |
| *R. brunneoviolacea* Crawshay | E. Rare. |

| | |
|---|---|
| *R. densifolia* (Secr.) Gillet | C, D. Rather uncommon. |
| *R. emetica* (Schaeff. ex Fr.) Gray | C, E. Uncommon. |
| *R. fellea* (Fr.) Fr. | D, E. Probably common. |
| *R. foetens* (Pers. ex Fr.) Fr. | D. Uncommon. |
| *R. fragilis* (Pers. ex Fr.) S. J. Schaeff. | C, D, E. Abundant. |
| *R. knauthii* Sing. | C, E. Common. Doubtfully distinct from *R. fragilis* in our opinion. |
| *R. laccata* Huysman (=*olivaceoviolascens* Gillet ss Moser) | NCR. D. Abundant under *Salix* in 'swamp' area. |
| *R. mairei* Sing. | E. Rather rare. |
| *R. nigricans* (Bull. ex Merat) Fr. | A, C, D. Common. |
| *R. ochroleuca* (Pers. ex Secr.) Fr. | A, C, D. Common. |
| *R. parazurea* Schaeff. | A, D, E. Common. |
| *R. raoultii* Quél. | NCR. D. One collection, September 1979. |
| *R. rosea* Quél. | C, D. Uncommon. |
| *R. sorroria* (Fr.) Romell. ss Boud. | A, D, E. Common. |
| *R. vesca* Fr. | A. Uncommon. |
| *R. xerampelina* (Schaeff. ex Secr.) Fr. | E. Uncommon. |
| *Lactarius cimicarius* (Batsch. ex Secr.) Gillet | D. Uncommon. |
| *L. glyciosmus* (Fr. ex Fr.) Fr. | D, E. Common where the birches occur. |
| *L. quietus* (Fr.) Fr. | A, C, D, E. Common. |
| *L. rufus* (Scop. ex Fr.) Fr. | C, D. Uncommon. |
| *L. subdulcis* (Pers. ex Fr.) S. F. Gray. | A, E. Uncommon. |
| *L. turpis* (Weinm.) Fr. | B, C, D. Uncommon. |
| *L. vietus* (Fr.) Fr. | D. Uncommon. |

## BOLETALES

### BOLETACEAE

| | |
|---|---|
| *Boletus* sp. | A. Reservoir Wood, October 1981. This appears to agree with an unpublished species mentioned in Pearson's notes, which he called *B. ambiguous* (R. Watling, pers. comm.). If this is so, then the species is new to Essex. |
| *B. armeniacus* Quél. | NCR. D. At roadside near James Lane, August 1976. |
| *B. badius* Fr. | A, C, D, E. Common. |
| *B. chrysenteron* Bull. ex St Amans. | A, D, E. Common. |
| *B. edulis* Bull. ex Fr. | A, D. Uncommon. |
| *B. erythropus*. (Fr. ex Fr.) Pers. | D. Uncommon. |
| *B. porosporus* (Imler) Watling, (=*Xerocomus truncatus* Sing., Snell & Dick ss. Moser) | A, D, E. Common. |
| *B. subtomentosus* L. ex Fr. | A, B, C. Common. |
| *B. vaccinus* Fr. ss. Watling. | D. Uncommon. |
| *B. versicolor* Rostk. (=*B. rubellus* Krombh.) | D, E. Uncommon. |
| *Leccinum duriusculus* (Schulz) Sing. | C. Uncommon. |
| *L. roseofracta* Watling. | NCR. D. October 1979. |
| *L. scabrum* (Fr.) S. F. Gray. | C, D. Uncommon. |
| *L. umbrinum* Fr. ss. Blum. | NCR. D. October 1979. |
| *L. variicolor* Watling | D. Uncommon. |
| *Gyroporus castaneus* (Bull ex Fr.) Quél. | D. August 1976. |

### PAXILLACEAE

| | |
|---|---|
| *Paxillus involutus* (Batsch. ex Fr.) Fr. | A, C, D, E. Abundant. |

## APHYLLOPHORALES

### THELEPHORACEAE

| | |
|---|---|
| *Thelephora terrestris* (Ehrl.) Fr. | A, C, E. The segregate. Common. |
| *T. terrestris* (Ehrl.) Fr., agg. | A, C, D, E. Common. We believe it likely that further studies will elucidate the presence of further species in the area. |

| | |
|---|---|
| STEREACEAE | |
| *Sterum hirsutum* (Willd. ex Fr.) Fr. | T. Abundant. |
| *S. rugosum* (Pers. ex Fr.) Fr. | A, C, D, E. Common. |
| *S. gausapatum* (Fr.) Fr. | A, E. Uncommon, but possibly overlooked. |
| *Chondrostereum purpureum* (Pers. ex Fr.) Ponzara | T. Common. |
| HYMENOCHAETACEAE | |
| *Inonotus radiatus* (Sow. ex Fr.) Karst. | A. Rare. |
| *I. dryadeus* (Pers. ex Fr.) Murr. | C. Rare. |
| GANODERMATACEAE | |
| *Ganoderma adspersum* (Schulz.) Donk. | A, B, C, E. Common. |
| *G. lucidum* (Curt. ex Fr.) Karst. | A, E. Uncommon. |
| POLYPORACEAE | |
| *Polyporus squamosus* Huds. ex Fr. | A, C, D, E. Common. |
| *P. rostkovii* Fr. | A. Rare. |
| *Meripilus giganteus* (Pers. ex Fr.) Karst. | A, B. Uncommon. |
| *Grifola frondosa* (Dicks. ex Fr.) S. F. Gray. | A. Reservoir Wood, 1979 and 1981. |
| *Hapalopilus nidulans* (Fr.) Karst. | A. Uncommon. |
| *Fomes fomentarius* (L. ex Fr.) Kickx. | A. The Bund, October 1979. |
| *Bjerkandera adusta* (Willd. ex Fr.) Karst. | T. Common. |
| *Piptoporus betulinus* (Bull. ex Fr.) Karst. | T. Common. |
| *Laetiporus sulphureus* (Bull. ex Fr.) Murr. | A, C, E. Uncommon. |
| *Tyromyces albellus* (Peck.) Bond & Sing. | A, D. Uncommon. |
| *Coriolus versicolor* (L. ex Fr.) Quél. | T. Abundant. |
| *Pseudotrametes gibbosa* (Pers.) Bond & Sing. | A. Rare. |
| *Daedalea quercina* L. ex Fr. | D. A single collection in 1983. |
| *Daedaleopsis confragosa* (Bolt. ex Fr.) Schroet. | A, D. Uncommon. |
| *Ceriporiopsis gilvescens* (Bres.) Dom. | C, E. Common. |
| *Schizopora paradoxa* (Schrad. ex Fr.) Donk. | A, C, D. Common. |
| FISTULINACEAE | |
| *Fistulina hepatica* Schaeff. ex Fr. | T. Common. |
| CLAVARIACEAE | |
| *Clavaria vermicularis* Fr. | D. On railway embankment, 1983. Probably overlooked elsewhere. |
| CLAVULINACEAE | |
| *Clavulina cinerea* (Fr.) Schroet. | D. Common. |
| *C. cristata* (Holmsk. ex Fr.) Schroet. | D. Common. |
| *Clavulinopsis helvola* (Fr.) Corner. | Only recorded in the City of London Cemetery, but probably overlooked. |
| *C. cinereoides* (Atk.) Corner. | NCR. A. Uncommon. |
| CORTICIACEAE | |
| *Phlebia merismoides* Fr. agg. | T. Common. |
| MERULIACEAE | |
| *Merulius tremellosus* (Schrad.) Fr. | A, D, E. Common. |
| *GASTEROMYCETES* | |
| PHALLALES | |
| PHALLACEAE | |
| *Phallus impudicus* L. ex Pers. | A, C. Rare. |
| LYCOPERDALES | |
| LYCOPERDACEAE | |
| *Lycoperdon foetidum* Bon. | A, D, E. Uncommon. |
| *L. perlatum* Pers. ex Pers. | A, D. Common. |
| *L. pyriforme* Schaeff. ex Pers. | A, C, D, E. Abundant. |
| *Calvatia excipuliformis* (Schaeff. ex Pers.) Perd. | D, E. Uncommon. |

*Langermannia gigantea* (Batsch. ex Pers) Rostk. — A, B and Wanstead Sewage Works. Uncommon, but a frequent target of small boys, so possibly under recorded.

GEASTRACEAE

*Geastrum striatum* DC. — A, D. A specimen was found near the James Lane area of Leyton Flats in 1946, (in Herb. Passmore Edwards Museum). There was a specimen on a sports ground at Wanstead, (possibly near the golf course?) in 1963 (Boardman 1963).

*Bovista nigrescens* Pers. ex Pers. — Wanstead Sewage Works Only. Common.

*B. plumbea* Pers. ex Pers. — A, D. Uncommon.

*Vascellum pratense* (Pers.) Kreisel. — D. Railway embankment. Uncommon.

SCLERODERMATALES

SCLERODERMATACEAE

*Scleroderma cepa* Pers. — A, D. Very local but in good numbers.

*S. citrinum* Pers. — A, C, D, E. Common.

*S. verrucosum* (Bull.) Pers. — D. Rare. Near willow 'swamp' only.

SPHAEROBOLACEAE

*Sphaerobolus stellatus* Tode. ex Pers. — C, and Wanstead Sewage Works. Probably overlooked elsewhere.

*PHRAGMOBASIDIOMYCETES*

TREMELLALES

TREMELLACEAE

*Exidia glandulosa* (Bull. ex St Amans) Fr. — C. Uncommon.

AURICULARIALES

AURICULARIACEAE

*Hirneola auricula-judae.* (Bull. ex. St Amans) Wettst. — A, C, E. Common.

*H. mesenterica* (Dicks. ex S. F. Gray) Pers. — T. Abundant.

DACRYMYCETALES

CALOCERACEAE

*Dacrymyces stillatus* Nees ex Fr. — A, B, E. Common.

*Calocera cornea* (Batsch. ex Fr.) Fr. — A, C, D. Common.

## Analysis

### *(a) Regional*

| Region | Number of Species | Number of new Essex Records |
|---|---|---|
| Wanstead Park | 163 | 8 |
| Wanstead Flats | 69 | 1 |
| Bush Wood | 92 | 0 |
| Leyton Flats | 153 | 12 |
| Gilbert's Slade/Rising Sun Woods | 86 | 0 |
| Total for Southern Epping Forest | 282 | 21 |

### *(b) Species totals*

| | | | |
|---|---|---|---|
| Agaricales | 193 | Holobasidiomycetes | 243 |
| Boletales | 17 | | |
| Aphyllophorales | 33 | | |
| Phallales | 1 | Gasteromycetes | 14 |
| Lycoperdales | 9 | | |
| Sclerodermatales | 4 | | |

| | | | |
|---|---|---|---|
| Tremellales | 1 | Phragmobasidiomycetes | 5 |
| Auriculariales | 2 | | |
| Dacrymycetales | 2 | | |

| | |
|---|---|
| Total BASIDIOMYCOTINA | 262 plus 3 varieties. |
| Total ASCOMYCOTINA | 20 plus 1 variety. |
| Total large fungi | 282 plus 4 varieties. |

## Acknowledgements

The authors are grateful to all those people who accompanied them on various fungus forays into the study area, and thus contributed by finding specimens which may otherwise have been overlooked. In particular, we wish to thank in this respect members of the Wren Conservation Group, especially Richard Baker and Paul Ferris, who made many records on their own excursions into southern Epping Forest. We also wish to record our thanks to Audrey Yelland who contributed records of Ascomycotina and accompanied us on forays to Leyton Flats.

Finally, we wish to thank Ian G. Robertson, M.A., F.M.A., Curator of the Passmore Edwards Museum, for allowing his staff to type the drafts of this paper, as well as Barbara Ellis for the actual typing itself.

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# Book Review

*The Dragonflies of Great Britain and Ireland.* By C. O. Hammond. Second edition revised by R. Merritt. Harley Books, Colchester. 1983. 116 pp., 20 col. pls, 44 maps. incl. £16.95. ISBN 0 946589 00 3.

When Hammond's book was first published in 1977 it was warmly received by many dragonfly enthusiasts because there were no other works on the British Odonata currently in print, and none had been readily available for many years. The enormous upsurge of interest in dragonflies caused by this publication eventually led to the establishment of the British Dragonfly Society, which at present has over 300 members.

The most striking feature of the book is the large colour plates which clearly show the diagnostic characters of all the resident species and common migrants. In this new edition colour figures of the male *Coenagrion lunulatum*, discovered for the first time in the British Isles in Ireland in 1982, are included as well as the characteristic facial markings of the three corduliid species. These have all been illustrated by Roderick Dunn and perfectly complement Hammond's original paintings. The tone of some of the plates have also been altered to resemble the colours of the living insects more closely. The distribution maps of each species have been updated with data received by the Odonata Recording Scheme to April 1983, in order to include a further 7,500 records, and now give a much clearer impression of the status of our resident species.

Other new aspects in this revision include a section written by Professor Norman Moore on the conservation of Odonata, amendments to the flight periods of many species and various nomenclature corrections. The introduction has been slightly modified to include some recent findings of Odonata biology and to place less emphasis on collecting techniques. Most of the errors and shortcomings noted by Parr *(Notulae Odonatologicae* 1: 14-16, 1978) in his review of the first edition have been corrected. However, it is slightly irritating to see that females of *Ischnura elegans* and *I. pumilo* are still incorrectly stated to have bicolorous pterostigmata.

Unfortunately the opportunity was not taken, with the publication of this revision, to improve some of the other weak points of the book. The distribution maps are pointlessly reproduced twice; once in small format, next to the description of each species, and again in a larger, more usable form in a section of their own towards the end of the book. In addition, ease of reference could have been improved by placing the large maps in the same sequence as the plates rather than arranging them to follow the order of the check-list.

The species descriptions themselves could have been improved by providing supplementary information to that shown in the plates, such as lateral thoracic markings. Moreover, some of the fairly common female colour forms which occur in zygopteran species such as *Ischnura pumilio, Coenagrion puella* and *Enallagma cyathigerum* are not even mentioned. The female of *C. lunulatum* is not figured and is only briefly described whilst the wing colorations of the *Calopteryx* species are poorly reproduced. It would also have been useful to have included more biological and ecological information than the cursory comments provided for each species.

At nearly £17.00 this book seems rather expensive and its dimensions (21 × 26 cms) make it impractical for use in the field. One would have hoped that a book of this price and size would have contained more in-depth information. However, the excellence of the colour plates and the fact that it is the only identification guide currently available make it indespensable to anyone interested in British dragonflies.

S. J. Brooks

# A Survey of the Flora of Kensal Green and St Mary's Cemeteries, 1981-1983

by J. B. LATHAM*


## Summary

From 1981 to 1983 a survey was made of the vascular plants, including grasses and ferns, of Kensal Green Cemetery in North Kensington. This large London cemetery, which was opened in 1832, is interesting botanically by virtue of its mosaic of relict and newly made habitats — damp meadow, hedgerow, disturbed ground and calcareous grassland. The survey includes the smaller adjoining St Mary's Roman Catholic Cemetery. As would be expected there is extensive cross-over of species, but each area contains also species which are not found in the other. Excluding species that were planted originally and have not spread appreciably from their original sites by natural means, a total of six pteridophytes, one gymnosperm and 313 angiosperms are recorded.

A short appendix comments on the past flora.


## Introduction and Description of the Cemeteries

The cemetery of All Souls, or Kensal Green as it has come to be known, dates from 1832. It was the first of the large city necropoli which were constructed to relieve the overcrowding of the smaller London churchyards. By 1832, when the cemetery was opened, such overcrowding had for long been a public scandal. Fears were expressed for the health of the people living and working near to these places owing to the noxious vapours which emanated from them.

The new cemeteries would be situated at a healthy distance from the dense centres of population which they served, in rural or semi-rural surroundings, preferably on rising ground so that the visitor might enjoy fine views over the surrounding countryside. Far from being places to avoid they were to be places of public resort where the pent city dweller could refresh his lungs with the invigorating air and, as he strolled the winding walks between the monuments, muse on Life, Death and Immortality (Anon. 1846).

At the time the cemetery was built, Kensal Green was a mere hamlet set in a landscape of small fields and waterlogged pastures. The painter George Moreland lived and worked in the area in the late 18th century. His prolifically produced rural scenes, directly inspired by his surroundings, give us an excellent idea of what this part of the country looked like before it was swallowed up by urbanisation. The contemporary prints which were produced in large numbers from his paintings are still widely available in secondhand shops.

Moreland died in 1804. However, even in his time the first signs of urbanisation were in evidence. The Grand Junction Canal, which now runs along the south side of the cemetery, was opened in 1801. In 1838 the railway was built which runs to the south of the canal. An 1850 map shows the nearby gasworks newly constructed which has in the last few years fallen into disuse. Yet as late as the 1860s the cemetery was still set in the largely rural surroundings which Moreland knew so well and the 400-year-old pub where he used to tipple, 'The Plough', still stood at its eastern corner. However it was soon to be swept away in the tide of progress. The present pub, also called 'The Plough', stands on the site. It dates from late Victorian times and is contemporary with the surrounding streets.

The cemetery (Fig. 1) comprises some 53 acres. It is situated at the highest point of North Kensington, 150 feet above sea level. There is a fine view of distant streets and churches looking down the main drive from the Doric temple which crowns the cemetery astride its imposing terrace. But the view must have been

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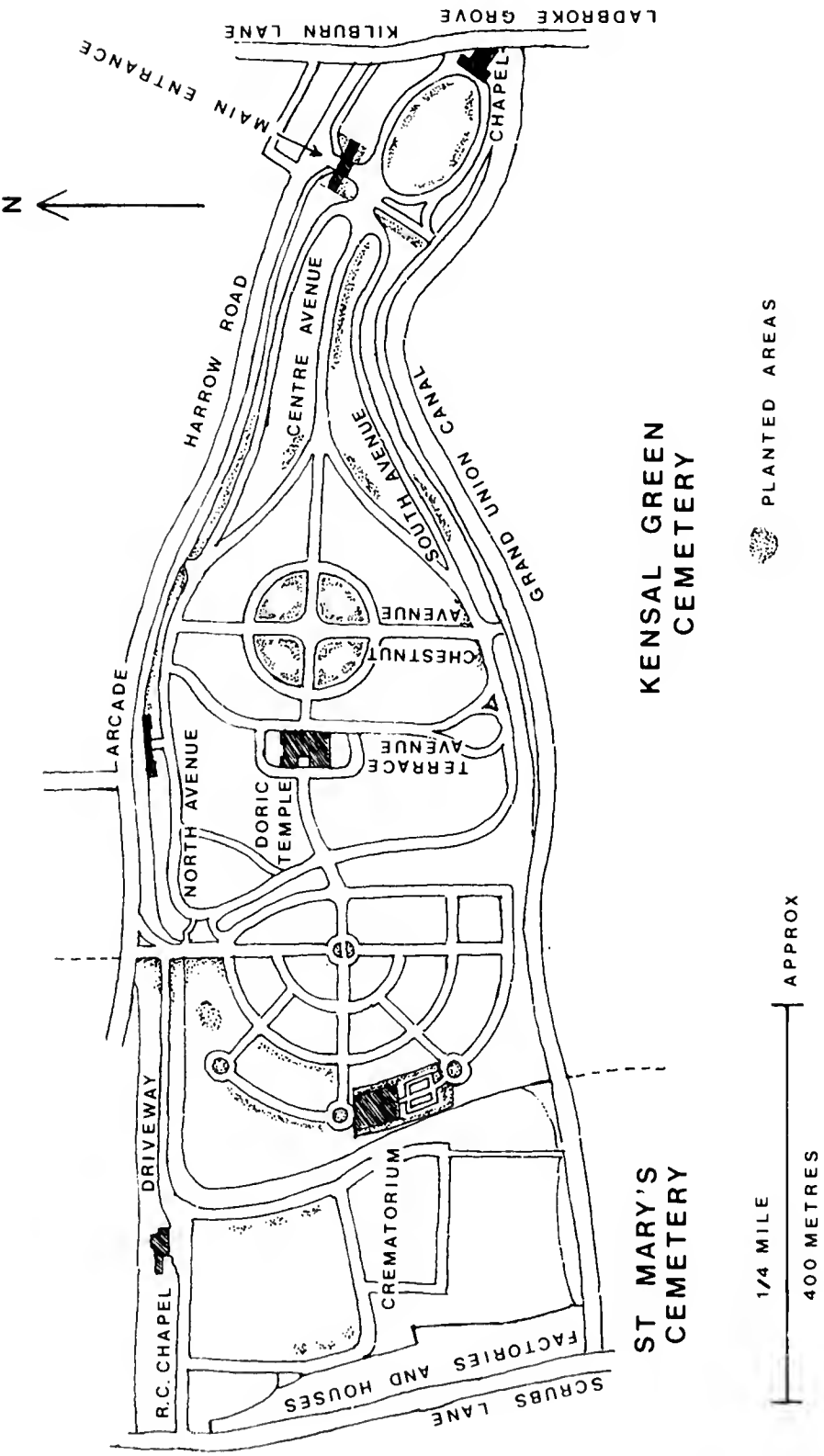


FIG. 1. Kensal Green and St Mary's Cemeteries.

finer still in 1832. Prints of the time give us a good impression of what the cemetery must have looked like in those early days. Stiffly dressed couples are depicted, sedately perambulating winding walks which are edged with formal beds. A strategically placed evergreen or weeping specimen tree gives an effect of pleasing melancholy to the scene whilst, typically, the main triumphal entrance arch or one of the temples forms a distant backdrop. There were, we are shown, comparatively few monuments and large areas of neatly trimmed lawn. The general effect is reminiscent of Père Lachaise cemetery in Paris opened in 1804, on which Kensal Green was directly modelled (Gladstone 1924). Gladstone reproduces a selection of these prints and the curious reader is also referred to an earlier publication (Mackenzie 1857). Nowadays the canal is largely a neglected resource. It only really comes into its own at weekends when riverboats ply to and fro and teenage motor-cyclists make noisy illegal use of the towpath disturbing anglers and dog walkers at their more leisurely pursuits. In the early years of the cemetery, before the coming of the railway, visitors used to travel to Kensal Green nearly as regularly by boat as by road, entering via the eastern canal gate which is now disused and kept locked. *Humulus lupulus* grows in the vicinity of the gate and railing and twines up their bars. In the 1830s it was the common practice of public house landlords to brew their own beer and cultivate their own hops for flavouring (Gladstone 1924). Assuming that *Humulus lupulus* is not indigenous here, it is quite possible to believe that the hops presently to be found in the south-east of the cemetery owe their origin to the crop locally cultivated by successive landlords of the nearby 'Plough', both in its ancient and modern incarnations. Certainly J. B. L. Warren could find *Humulus lupulus* near Kensal Green in the 1860s (Trimen and Dyer 1869: 254).

Many of the landscape trees originally planted with the opening of the cemetery remain. A large proportion of the species have become naturalised either vegetatively or by seed, some to a far greater extent than others. The quick-growing *Populus canescens* and *Quercus cerris* are two of the most widely established of the introduced trees and will form dense stands if permitted. At the other extreme, a mature planted specimen of *Carpinus betulus* by the northern boundary wall has managed to produce only a scattering of distinct root suckers. I have found only one self-sown sapling from the two massive *Fagus sylvatica 'purpurea'* in the cemetery. It nestles in the shelter of a large *Aesculus hippocastanum* by Centre Avenue. Typically, the widespread regenerations of trees such as grey poplar are to be found in a sapling or shrubby state, for regular clearance operations ensure that few reach maturity. The truly indigenous species such as *Quercus robur* and *Betula* spp., which have established themselves naturally in the cemetery, are also generally to be found in immature stages for the same reason. However sapling trees which happen to be growing hard by walls and railings have a much better chance of escaping the attentions of the workmen and so growing to the flowering stage. The well-grown *Ulmus glabra* by the northern boundary wall are an illustration of this.

A small number of originally planted trees have been unable to spread to other sites. Main examples are Indian bean *Catalpa* sp., swamp cypress *Taxodium* sp., *Castanea sativa,* and *Platanus hybrida.* It seems only a matter of time before the last two, at least, extend their range, for they now produce strong stool shoots.

Similar habits of naturalisation may be observed in the case of the planted shrubs in older areas. *Phillyrea, Aucuba japonica* and other evergreens are increasingly spreading by suckers, in some cases a good distance from their parents. As yet few of these regenerations have reached the flowering stage.

Aliens, adventives and relics of cultivation flourish in the areas of disturbed ground where burials are still taking place. Of the garden escapes, such plants as *Calendula officinalis, Lobularia maritima* and *Delphinium ambiguum,* which usually spring up from dumped garden soil, rarely persist. Others like *Nigella damascena,* have survived in local abundance before succumbing to deliberate clearance. Still others, such as *Saponaria officinalis* and *Galega officinalis,* have

become fully established components of the flora. A few are serious pests.

A good knowledge of the cemetery and its immediate environs makes clear the origin of most of these plants. The gardens attached to the entrance lodges and crematorium and the more recent graves planted as gardens in miniature are an ever fruitful source of short-lived escapes in the cemetery giving an unnatural garishness to its flora in some parts. The traffic is two way, for weeds like *Euphorbia peplus* and *Veronica polita,* invade these garden plots. The exotic *Euphorbia esula,* has very likely entered the cemetery via a nearby railway bank where I have found it in quantity. The railway bank and the banks of the canal running parallel to it are virtual highways of dispersal for all kinds of aliens and adventives. One can also point to the narrow strip of allotments lying between the canal and the southern boundary railing of the cemetery as a source of *Lepidium sativum, Rubus idaeus* and *Brassica rapa* subsp. *campestris.*

It is a matter of speculation in the case of some species as to whether they are truly indigenous to the cemetery or simply native species which have been planted here long ago and escaped. There can be no doubt that *Myosotis sylvatica* is exclusively a garden escape despite the presence of semi-woodland areas in the cemetery and that the few hornbeam saplings are descended from a planted tree, but the position regarding *Primula vulgaris* and *Endymion nonscriptus* is less clear. There is no reason why both species should not occur naturally here, although it is known that both have been deliberately planted on and around graves. In the case of *Primula,* hybridisation between the native stock and garden exotics produces polyanthus forms and a range of flower colours from the usual pale yellow through lilac to a deep almost reddish-purple. Hybrid swarms of transitional hues may be seen.

Of late years the cemetery, like other Victorian necropoli, has suffered badly from neglect and attendant vandalism to the detriment of its monuments and botanical interest alike. It has fared better than some which have had to be closed down completely. At Kensal Green continuing interments, with the income they bring, ensure that at least basic maintenance is carried out. The conspicuous presence of maintenance workers probably deters the worst of the vandals although a few important monuments have been ruined beyond repair. All the portrait busts such as those of Tom Hood and George Cruikshank have been smashed.

Kensal Green Cemetery is still administered by the General Cemetery Company as it was at its foundation, but the cemetery which made high profits in its early days is now in financial straits, and the small workforce it can afford to employ fight a rearguard action against the advancing vegetation. As in so many other city cemeteries *Acer pseudoplatanus* is the main menace, closely followed here by *Symphoricarpos* and *Cardaria draba.* Maintenance is by burning, mechanical cutting and herbicide spraying. The hand scythe is still used where the closeness of the headstones precludes the use of the mechanical cutter and where floral tributes in the vicinity would be damaged by spraying. Burning can sometimes get out of hand when the grass is dry, causing damage to newly laid wreaths and crosses of flowers. On older burnt ground *Funaria hygrometrica* occurs.

The original landscaping of the cemetery is still in evidence although much obscured by the natural spread of original plantings and further infill by invasive species. Specimen trees such as those depicted in the old prints have typically reached an impressive size. The great *Fraxinus excelsior* by the main entrance is a good example. Some, such as copper beech, have begun to be attacked by timber-rotting fungi. The original avenues of *Populus nigra 'Italica'* are now over mature and individual trees have begun to collapse. These collapsed trees, if they happen to have fallen in a disused part of the cemetery, are generally left to lie where they fallen for many months, even years, rendering some of the smaller paths impassable. But there are fine avenues of *Quercus ilex* and the hybrid

*Populus canadensis* which show no sign of decay. The surviving weeping trees of birch, beech and ash are now reverting to their ancestral mode of growth giving the specimens an appearance very different from that originally intended. The reversion, typically, begins at the main point of growth and gradually spreads outward. It is only a matter of time, perhaps, before these trees lose the pendulous habit entirely. Many Lombardy poplars, developing vigorous stool shoots, exhibit a similar distortion of their original shape.

In some parts of the cemetery remnants of the original flora which must have been characteristic of the pre 1860s Kensal Green are in evidence, notably in older but still well maintained areas. This distinctive flora includes species characteristic of open coppices such as *Anemone nemorosa, Primula vulgaris, Endymion nonscriptus,* and others associated with damp meadowland such as *Filipendula ulmaria, Achillea ptarmica, Senecio erucifolius,* and *Sanguisorba officinalis.* Another group, comprising species typical of hedgebank and woodland edge includes *Arum maculatum, Viburnum opulus, Clematis vitalba* and *Tamus communis.*

This indigenous flora is threatened by the aggressive spread of certain rapidly colonising species into their territories. Consequently, some indigenous species, which were probably never over abundant here, have become rare. Black bryony is now confined to one side of an old family vault and bulbous buttercup is known only from a single clump on a dry bank, although in the case of this species the scarcity of suitable habitat may have as much to do with its rarity as competition from aggressive colonisers. *Ranunculus bulbous* is naturally a constituent of dry, lime-rich grassland. The predominantly damp meadowland habitat of Kensal Green must always have been unfavourable to it. Significantly, it is a common plant in the mainly dry grassland habitat of Brompton Cemetery, Kensal Green's nearest neighbour.

In the older areas of grassland there are extensive groups of anthills, the work of the red ant *Lasius flavus,* indicating that the ground here has lain undisturbed for many years. Thale cress *Arabidopsis thaliana* thrives on the well drained soil of these hills. In summer the ants have learned the habit of climbing the stems of hogweed *Heracleum sphondylium,* to sip nectar from the umbels. It is interesting to note the tendency of older anthills to spill over onto surrounding flat gravestones.

The most abundant grasses are *Poa trivialis, Alopecurus pratensis* and *Dactylis glomerata.* In late summer, having gone to fruit and shed their seeds, they remain to form dense brown stands, the favourite haunt of crytically coloured grasshoppers which utter their monotonous song all day long. In heavy rain the grassland and the narrower paths become waterlogged, attracting roosting mallards from the nearby canal. They are not the tame mallards such as one finds in parks for they will fly away noisily at the first approach of a human being.

Some grasses present in lesser quantity are *Bromus mollis* and *Festuca rubra. Brachypodium sylvaticum* is a feature of shady, untended walks in older parts of the cemetery.

Available ground for new burials is becoming increasingly scarce. As a result the grass verges bordering the main drives in the older parts of the cemetery are now being utilised for grave plots, a purpose for which they were certainly never originally intended. The process is particularly in evidence along the main driveway to the Doric chapel, known as 'Centre Avenue'. Despite such fragmentation the total area of permanently maintained grassland in the cemetery remains impressive. It ranges from the aforesaid verges and the small well-kept plots devoted to graves of the First World War, to the large lawns on the rising ground around the Doric temple and in the extreme west of the cemetery near the 1930s crematorium, the most recent major building to be erected in the cemetery. One or two of the more grandiose mausoleums also have their own small lawns enclosed within railings which are ordered to be maintained in perpetuity. This

habitat supports a distinctive flora, notably *Prunella vulgaris, Ajuga reptans, Glechoma hederacea* and *Cynosurus cristatus*. In autumn these plants give way to a characteristic group of small delicate fungi adapted to a lawn habitat, *Hygrophorus psittacinus* and *Mycena flavo-alba* among them. The bugle and ground ivy also occur on the walls of old mausoleums in the area.

The main entrance to the cemetery is from Harrow Road east of Kensal Green underground station and comprises a classical gateway flanked by administrative offices. The well-kept gardens attached to these offices form a strong contrast to the neglected vegetation nearby in what is the oldest part of the cemetery, although, even here, new graves are encroaching to mingle with the old. From this eastern entrance Centre Avenue makes a gradual ascent to the main Anglican chapel, an imposing Doric temple with flanking colonnades on a raised terrace. The liverwort *Marchantia polymorpha* is common between the flags of this terrace. *Caloplaca citrina,* a bright orange crustose lichen, grows on its walls, and on damp brickwork below the terrace *Phyllitis scolopendrium* flourishes.

South of the terrace is a planted group of *Yucca gloriosa.* Over the years there has been extensive natural regeneration with consequent spread of the yucca so that it is now difficult to distinguish the original boundaries of the plantation. The core of the colony has formed a dense mound of plants. New plants may be seen sprouting from detached and partly decayed fragments of rhizome at some distance from the main colony. The flowering spikes of these plants make a fine display at a season when most other plants in the cemetery are not in flower.

Eastward of the main entrance lies a small classical temple in the ionic style, at one time a chapel but now derelict. On waste ground nearby I have found *Lamium hybridum* and *Thlaspi arvense.*

A wide straight avenue bisects the cemetery from north to south and is bisected in its turn by Centre Avenue. It has no official name but I have named it for the sake of convenience Chestnut Avenue with reference to the mature horse-chestnuts which darken its southern approach. In their shade grows *Viburnum opulus* in a non-flowering state and probably indigenous here.

Westward of the main entrance and approached via North Avenue, there is a narrow pillared arcade once used for the display of memorial tablets but now ruinous. *Asplenium adiantum-nigrum* grows on the crumbling display wall as well as on nearby family vaults. The widespread use of synthetic stone for the larger monuments in the cemetery means that it has a comparatively poor flora of wall growing plants. In this respect Brompton Cemetery which boasts large areas of decaying natural stonework is superior to Kensal Green. The Brompton specialities, *Parietaria diffusa* and *Mycelis muralis,* may be searched for in vain here.

South Avenue leads us eventually to a dumping ground for general cemetery and garden refuse much frequented by rats. Part of the dump backs onto the boundary railing of the canal-side allotments and it is probable that the allotment owners use it too. This would explain the presence of naturalised potato plants *Solanum tuberosum* just by the railing. The area of the dump is partly surrounded by a dense growth of *Acer pseudoplatanus* which has rendered practically inaccessible an extensive area of graves nearby. The gloom is relieved in early summer by a fine display of *Anthriscus sylvestris.* At the edge of one of these sycamore stands and heavily shaded by its leaves in summer may be found a well-grown *Malus* sp., the only specimen in the cemetery which has attained the flowering stage. However fruit is not yet produced. The large number of *Malus* saplings in the cemetery as a whole have evidently largely arisen from lunchbox throw-outs.

The heavy traffic of motorised mourners to the various chapels ensure that Centre Avenue remains bare of vegetation except at its borders. On the lesser paths lorry and car tyres have left a central strip of vegetation composed of various grasses, plantains and dwarf clumps of *Lotus corniculatus. Plantago major*

growing along one such path showed an interesting range of fasciculations. In one case the flowering spike had turned into a mass of tiny leaf-shoots. In another pseudo-shoots had formed on the rachis. All affected plants tended to turn a deep red. Some of these paths are not gravelled. In such cases during heavy rain through traffic gouges deep tyre tracks in the soft mud and linear puddles are soon formed. These puddles support growing stages of the mosquito *Culex pipiens* and swarming midge *Chironomus tentans*. The narrowest paths, designed for pedestrians only, are carpeted with *Potentilla reptans* which also readily spreads over flat graves. This is a species intolerant of trampling and its abundance on such paths indicates how little they are used at present.

The grand vaults, monumental plinths and table tombs lining the wider paths support a small but interesting selection of climbing and semi-climbing plants. *Hedera helix* is the commonest on walls as well as vaults where it may form characteristic knots of growth, a favourite nesting site for wasps. Other climbers are much more scarce. *Lathyrus grandiflorus, Tamus communis* and *Clematis viticella* and may be mentioned here, each represented by a single site.

At the extreme west end of the cemetery stands the pseudo-classical crematorium with its attached chapel. These buildings open onto a well-kept memorial garden with rose beds, an avenue of clipped beeches and walls for the display of memorial tablets. The visual monotony common to such places is relieved here by a good display of lichens on walls and paths, notably *Physcia caesia, P. grisea* and *Lecanora muralis*. There is little of botanical interest apart from the crab grass *Digitaria* sp., one of the few bird-seed aliens to be found in the cemetery.

Fruit trees planted in this extreme western area are the source of numerous bird-sown seedlings and saplings found in older areas. The most frequent species are *Sorbus aucuparia* and *Cotoneaster simonsii*. One small rowan tree has been found on the roof of a mausoleum growing in company with a birch of the same age. *C. frigidus* appears to be on the increase. Ornamental plantings continue in this area, one of the most recent being an avenue of *Populus alba*. It is expected that in due course these new plantings will contribute to the naturalised flora of the cemetery.

In the late 19th century a new cemetery was opened in response to the demands of the growing population of Irish immigrants and others of the Roman Catholic faith who lived in the area for their own burial ground. The cemetery of St Mary's is administered separately from its older neighbour. It extends from the western boundary wall of Kensal Green to Scrubs Lane and comprises some 20 acres. St Mary's repeats the range of habitats of Kensal Green cemetery but on a smaller scale. It has a more open and monotonous appearance for there is less tree cover; winding paths have been replaced by a grid-like pattern; the ground has less variety of contour; the graves, apart from a range of opulent monuments in the centre, show a depressing tameness of design; and the heavy use of herbicide on the grassland has led to a great reduction of native species there.

As might be expected the two cemeteries share many species so they lay claim to be treated as a single study area. However these shared species may occur in very different quantities in each cemetery. For instance *Lupinus polyphyllus* and *Agrimonia eupatoria* are dominant species in St Mary's but scarce in Kensal Green. Conversely *Primula valgaris*, so common in Kensal Green, is difficult to find as an indigenous species in St Mary's. Furthermore, each cemetery has species which so far as I have been able to find are unique to it. *Sanguisorba officinalis*, for example, quite common in Kensal Green, is absent from St Mary's, whilst *Symphytum officinale*, scarce in St Mary's, has not yet been discovered in Kensal Green. In addition there is a whole range of opportunist species which though they may have been found in only one cemetery may occur in either wherever there is disturbed ground and so cannot really be considered characteristic of either.

The occurrence of certain trees in St Mary's further distinguishes it from Kensal Green. St Mary's has planted maple trees which the larger cemetery lacks and these are now beginning to seed themselves. It is also characterised by free-standing specimens of *Salix cinerea* subsp. *atrocinerea*, and less commonly *Salix fragilis*. These willows have probably spread into the cemetery from the banks of the adjoining canal where older and more luxuriant trees may be found. There are some fine specimens of *Salix babylonica* in the far west of the cemetery, though they look painfully out of place among the grid-like paths and so close to the row of small business premises bordering Scrubs Lane. They would look much better in one of the older parts of Kensal Green.

A large tip of excavated soil lies against the east boundary wall of St Mary's extending along much of its length and, at the time of writing, almost overtopping it. Periodic clearances of the tip have prevented it from becoming overgrown and ensured its continual colonisation by short-lived species of waste ground. In July 1983 the tip was dominated by swathes of *Papaver somniferum, Coronopus didymus, Hordeum vulgare, Avena fatua,* and *Sisymbrium orientale.* which also established itself in other parts of the cemetery at that time. *Diplotaxis tenuifolia,* and *Erysimum cheiranthoides,* were present in lesser quantity. Both had dominated the tip at the same time the previous year. The tip terminates southward at a sand and cinder bunker. Here I have found *Gnaphalium uliginosum.*

St Mary's is reached via a long straight driveway which leads from the westerly gateway in Harrow Road to a small chapel with administrative offices attached. The graves flanking this driveway typically date from the late 1940s to the mid 1950s and are of a characteristic type also encountered in the newer parts of Kensal Green west of the Doric chapel. The traditional headstone in these newer graves often bears a faded sepia photograph of the deceased and is invariably supplemented by a low rectangular slab. Often this slab is covered with a layer of ornamental marble chips. Less often the chips are replaced by soil to create a mini garden or the stone is simply left bare.

Many of the slabs, especially the first type, now support an interesting group of wall and rockery plants such as *Armeria* sp., *Sedum reflexum* and *Sempervivum tectorum.* Most of these species were planted originally on the slabs or in special metal receptacles incorporated into their design, but in the course of time have multiplied vegetatively so as to become firmly established denizens of these specialised sites. Thrift on these sites has built up large mounds which are readily colonised by such species as *Plantago lanceolata* and *Poa annua,* taking advantage of the deep nutritive soil layer built up by the root system of their host. Some rockery species are able to leave the slabs or wall tops which they originally ornamented to colonise neighbouring grave slabs or to spread along the borders of gravel paths. The most successful of these colonisers has been *Sedum acre.* It is closely followed by *S. reflexum* and *S. album* in both cemeteries. As time goes by, in those frequent cases where rockery plants fail to colonise them, the garish coverings of marble chips build up a thin layer of soil where various mosses *Bryum* spp. and lichens flourish. The foliose *Cladonia squamosa* on a grave dated 1938 in the western part of St Mary's is a notable example. Such conditions of course are equally well suited to shallow rooted vascular plants. *Thymus drucei* was an unexpected discovery spreading slowly over the marble chip covering of a slab-and-cross grave dated 1947 near the chapel. It was probably introduced here accidentally by a relative of the deceased many years ago. Old garden type graves of this age are of less interest. Once abandoned they are soon invaded by rank weed species like chickweed and dandelion and the original plantings are quickly crowded out. Some escape to spread along paths like *Myosotis sylvatica,* a few manage to establish themselves on the walls of the grave, but most become extinct.

## SPECIES LIST

This list of vascular plants recorded in Kensal Green and St Mary's cemeteries from 1981 to 1983 excludes planted species which have so far failed to regenerate by natural means. Examples are weeping willow *Salix babylonica* and cypress *Cupressus* sp. The names and sequence follow Clapham, Tutin and Warburg (1962).

Locations are given by reference to topographical features and named paths already mentioned and shown on the map. These abbreviations are used:
KG Kensal Green Cemetery
SM St Mary's Cemetery

PTERIDOPHYTA

*Equisetum arvense* horsetail. Common in many parts.
*Pteridium aquilinum* bracken. Common in many parts.
*Phyllitis scolopendrium* hart's tongue fern. On damp walls near the Doric chapel.
*Asplenium adiantum-nigrum* black spleenwort. On damp walls near the Doric chapel.
*A. trichomanes* maidenhair spleenwort. On a wall of the David vault (1883) in the west of KG.
*Dropteris filix-mas* male fern. Common around the Doric chapel and by Centre Avenue.

GYMNOSPERMAE

*Taxus baccata* yew. Frequent bird-sown saplings of varying ages from planted specimens in older parts of KG.

ANGIOSPERMAE: DICOTYLEDONES

*Nigella damascena* love in a mist. Persisted in local quantity on waste ground by the western boundary wall of KG up to 1983.
*Delphinium ambiguum* larkspur. A semi-persistent garden outcast on SM tip.
*Anemone nemorosa* wood anemone. Common in older grassland in KG.
*Clematis vitalba* traveller's joy. A large mass by Chestnut Avenue north.
*C. viticella.* A garden escape persisting for several years by a grave in the south of KG where it was not originally planted.
*Ranunculus acris* meadow buttercup. Common in grassland in both cemeteries.
*R. repens* creeping buttercup. Common in grassland in both cemeteries.
*R. bulbosus* bulbous buttercup. One plant on a bank by North Avenue arcade.
*R. ficaria* pilewort. Common in grassland in KG.
*Aquilegia vulgaris* columbine. A common garden escape.
*Thalictrum minus* lesser meadow rue. A scarce garden outcast.
*Mahonia aquifolium* Oregon grape. A few self-sown saplings from a planted hedge near the western entrance into KG.
*Papaver rhoeas* common poppy. One feeble plant on SM tip in 1983.
*P. somniferum* opium poppy. Common on SM tip in 1983.
*Fumaria officinalis* fumitory. Fairly common on SM tip in 1983.
*Brassica rapa* subsp. *campestris* field cabbage. Common around new graves in the west of KG.
*Sinapis arvensis* charlock. Fairly common on waste ground.
*Hirschfeldia incana* hoary mustard. A few plants by South Avenue in 1981.
*Diplotaxis muralis* annual wall rocket. Sporadic around and on new graves in the west of KG.
*D. tenuifolia* perennial wall rocket. Common on SM tip in 1982. Less common in 1983.
*Raphanus raphanistrum* wild radish. Common on SM tip in 1983.
*Lepidium sativum* garden cress. By a grave near South Avenue.
*Coronopus squamatus* swine cress. Sporadic around new graves in the west of KG.
*C. didymus* lesser swine cress. Common, especially on SM tip.
*Cardaria draba* hoary cress. A pest in KG.
*Thlaspi arvense* field pennycress. Uncommon on waste ground in KG.
*Capsella bursa-pastoris* shepherd's purse. Common.
*Lobularia maritima* sweet alison. A frequent plant of dumped soil in KG.
*Armoracia rusticana* horse-radish. Common especially in SM.
*Cardamine pratensis* cuckoo flower. Scarce in damp grassland.
*C. hirsuta* hairy bittercress. Common in dry places.
*Barbarea vulgaris* common wintercress. Fairly common.
*Rorippa sylvestris* creeping yellowcress. Common in the west of KG.

*R. islandica* marsh yellowcress. Uncommon in the vicinity of SM tip.
*Hesperis matronalis* dame's violet. A scarce escape from grave plantings in the west of KG.
*Erysimum cheiranthoides* treacle mustard. Common on SM tip in 1982. Scarce in 1983.
*Cheiranthus cheiri* wallflower. Established on walls of a grave dated 1923 west of the Doric temple.
*Alliaria petiolata* garlic mustard. Common.
*Sisymbrium officinale* hedge mustard. Common.
*S. orientale* oriental mustard. Common on SM tip in 1983.
*Arabidopsis thaliana* thale cress. Common especially on ant-hills in KG.
*Viola riviniana* dog violet. Uncommon around the Doric temple.
*V.* × *wittrockiana* garden pansy. An outcast in the extreme west of KG.
*V. arvensis* field pansy. Scarce by a path in the extreme west of KG.
*Hypericum perforatum* St John's wort. Scattered in grassland in KG.
*Silene dioica* red campion. Uncommon in overgrown parts of KG.
*S. alba* white campion. Uncommon in open areas west of the Doric temple.
*Saponaria officinalis* soapwort. Double- and single-flowered forms occur in separate colonies in the east of KG.
*Cerastium holosteoides* common mouse-ear. On path sides.
*C. tomentosum* snow-in-summer. Established on old grave slabs in both cemeteries.
*Stellaria media* chickweed. Common.
*S. graminea* lesser stitchwort. Scattered in grassland in the south west of KG.
*Sagina procumbens* procumbent pearlwort. Common.
*Chenopodium polyspermum* many seeded goosefoot. Common in both cemeteries.
*C. album* fat hen. Common.
*C. ficifolium* fig-leaved goosefoot. Uncommon on SM tip.
*C. rubrum* red goosefoot. Uncommon in the extreme west of KG.
*Atriplex hastata* hastate orache. Common on waste ground.
*A. patula* common orache. Less common than the above in similar places.
*Tilia* × *vulgaris* lime. Widely naturalised from planted trees especially by South Avenue.
*Malva sylvestris* mallow. Common.
*Geranium dissectum* cut-leaved cranesbill. Common in the south west of KG.
*G. pusillum* small-flowered cranesbill. Frequent on grassy graves in KG.
*G. robertianum* herb robert. Common around the Doric temple.
*Acer pseudoplatanus* sycamore. A pest in KG.
*A. platanoides* Norway maple. Sparingly naturalised from a planted tree over 20 years old by North Avenue.
*A. campestre* field maple. Naturalising by seed from a row of planted trees in SM.
*Aesculus hippocastanum* horse chestnut. Widely naturalised.
*Ilex aquifolium* holly. Many wild trees.
*Euonymus europaeus* spindle tree. A few saplings by North and Centre Avenues.
*Parthenocissus* sp. Virginia creeper. Common on old tombs and monuments.
*Lupinus polyphyllus* lupin. Widely naturalised in grassland in SM.
*Laburnum anagyroides* laburnum. Widely naturalised in older parts of KG. No planted trees observed.
*Ulex europaeus* gorse. A few shoots soon destroyed on waste ground in SM.
*Medicago lupulina* black medick. Scattered in grassland.
*Melilotus officinalis* common melilot. Common on SM tip. Scarce elsewhere.
*M. alba* white melilot. Common on SM tip and waste ground in SM.
*Trifolium dubium* lesser trefoil. Uncommon in grassy places.
*T. campestre* hop trefoil. Common in grassy places.
*T. hybridum* alsike clover. Common on SM tip.
*T. repens* white clover. Common.
*T. medium* zig-zag clover. Uncommon in the south of KG.
*T. pratense* red clover. Common.
*Lotus corniculatus* bird's foot trefoil. Common.
*Galega officinalis* goat's rue. Common in SM. Increasing in KG.
*Robinia pseudoacacia* locust tree. Widely naturalised in KG.
*Vicia hirsuta* hairy tare. Scattered in KG.
*V. cracca* tufted vetch. Common.
*V. sepium* bush vetch. Common.
*V. sativa* common vetch. Common.
*Lathyrus pratensis* meadow vetchling. Common.
*L. latifolius* broad-leaved everlasting pea. Common everywhere.
*L. grandiflorus* two-flowered pea. Long established on a monument by North Avenue.
*Filipendula ulmaria* meadowsweet. Spreading by a path west of the Doric temple.

*Rubus idaeus* raspberry. Scattered in the south and west of KG.
*R. caesius* dewberry. Scattered in bushy places in KG.
*R. fruticosus* bramble aggr. Common.
*R. laciniatus* cut-leaved bramble. Scattered in SM.
*Potentilla reptans* creeping cinquefoil. Common.
*Fragaria vesca* wild strawberry. Uncommon by Centre Avenue.
*F.* × *ananassa* garden strawberry. Spreading by South Avenue.
*Agrimonia eupatoria* agrimony. Common in SM.
*Sanguisorba officinalis* great burnet. Scattered in grassland in KG. Four centuries ago this plant was 'between Paddington and Lysons Green' (Gerarde 1597).
*Poterium polygamum* fodder burnet. One plant at the junction of South Avenue and Terrace Avenue.
*Rosa rugosa* Japanese rose. The most widely naturalised of several species of cultivated rose which have escaped in KG.
*R. canina* dog rose. Common east of the Doric temple.
*Prunus spinosa* blackthorn. Scrub forming in SM. Scarce in KG.
*P. avium* wild cherry. Common.
*P. laurocerasus* cherry laurel. Widely planted. Naturalised by North Avenue arcade.
*Cotoneaster simonsii* Khasia berry. Bird-sown saplings in older areas.
*C. frigidus* tree cotoneaster. Bird-sown saplings in older areas.
*Crataegus monogyna* hawthorn. Common. Terminal shoots of young trees are much distorted by brown rosettes, the work of the gall midge *Perrisia crataegi*.
*Sorbus aucuparia* rowan. Bird-sown young trees in older areas.
*S. aria* whitebeam. Bird-sown saplings in older areas.
*Malus* sp. apple. Many saplings in both cemeteries. One mature tree in KG.
*Platanus* × *hybrida* plane. Old planted trees now regenerate from stool shoots in the centre of KG.
*Sedum spectabile* garden orpine. Frequent on dumped garden refuse.
*S. album* white stonecrop. Well established on old grave slabs.
*S. acre* wallpaper. Common on paths and graves.
*S. reflexum* reflexed yellow stonecrop. Well naturalised on old grave slabs in SM and also by paths, notably North Avenue, in KG.
*Sempervivum tectorum* houseleek. Well established on old grave slabs.
*Saxifraga hypnoides* mossy saxifrage. Well established as a spreading planting on a few old grave slabs in both cemeteries.
*Epilobium hirsutum* codlins-and-cream. Common.
*E. parviflorum* hoary willowherb. Uncommon.
*E. montanum* broad-leaved willowherb. Common.
*E. adenocaulon* American willowherb. Common.
*E. tetragonum* square-stalked willowherb. Common.
*Chamaenerion augustifolium* rosebay. Common.
*Oenothera biennis* lesser evening primrose. One plant by the western boundary wall of KG in 1982.
*Circaea lutetiana* enchanter's nightshade. Common.
*Thelycrania sanguinea* dogwood. Common.
*Aucuba japonica* spotted laurel. Well naturalised in older parts of KG.
*Hedera helix* ivy. Common.
*Chaerophyllum temulentum* rough chervil. Uncommon and sporadic.
*Anthriscus sylvestris* cow parsley. Common.
*Sison amomum* stone parsley. One colony at the junction of South Avenue and Terrace Avenue.
*Conopodium majus* pignut. Scattered.
*Pimpinella saxifraga* burnet saxifrage. Uncommon in the south of KG. Scattered in grassland in SM.
*Aegopodium podograria* goutweed. Common.
*Aethusa cynapium* fool's parsley. Common.
*Silaum silaus* pepper saxifrage. Scarce in older grassland in KG.
*Heracleum sphondylium* hogweed. Common.
*H. mantegazzianum* giant hogweed. One plant by South Avenue now chopped down.
*Mercurialis perennis* dog's mercury. Common.
*M. annua* annual mercury. Common.
*Euphorbia peplus* petty spurge. Common.
*E. esula* Hungarian spurge. Increasing in both cemeteries.
*Polygonum aviculare* knotgrass. Common.
*P. persicaria* redleg. Common.

*P. lapathifolium* pale persicaria. Common in both cemeteries.
*P. convolvulus* black bindweed. Common.
*P. baldschuanicum* Russian vine. Naturalised on the wall of North Avenue.
*P. cuspidatum* Japanese knotweed. Common.
*Rumex acetosella* sheep's sorrel. Common in the east of KG.
*R. acetosa* common sorrel. Common.
*R. crispus* curled dock. Common.
*R. obtusifolius* broad-leaved dock. Common.
*R. sanguineus* wood dock. Common.
*Helxine soleirolii* baby's tears. Only on the southern boundary wall of SM driveway. No planted source observed.
*Urtica urens* small nettle. Common.
*U. dioica* stinging nettle. Common.
*Humulus lupulus* hop. Uncommon by South Avenue.
*Ulmus glabra* wych elm. Common by North Avenue.
*U. procera* elm. Common as suckers by North and South Avenues. The gall mite *Eriophyes ulmicola* infests the leaves of some trees.
*Quercus cerris* Turkey oak. Widely naturalising from a planted specimen by North Avenue.
*Q. robur* English oak. Common as young trees and saplings.
*Q. ilex* holm oak. Widely naturalised from planted trees by Centre Avenue.
*Populus canescens* grey poplar. Widely naturalised from planted trees by South Avenue. In May flea beetles of the family Chrysomelidae feed heavily on young leaves.
*P. nigra 'Italica'* Lombardy poplar. Planted trees now spreading slowly by suckers along paths. Leaves of a tree by South Avenue are galled by the aphid *Pemphigus bursarius*.
*P.* × *canadensis* hybrid black poplar. Mature avenues of trees in the west and east of KG now starting to send up suckers.
*Salix fragilis* crack willow. Scattered in both cemeteries. Bean galls of the sawfly *Pontinia proxima* are noted on the leaves of some trees in SM.
*S. viminalis* osier. One tree by South Avenue, another in SM.
*S. caprea* pussy willow. Common.
*S. cinerea* subsp. *atrocinerea* common sallow. Scattered in both cemeteries.
*Rhododendron ponticum* rhododendron. Sparingly naturalised east of the Doric Temple.
*Armeria* sp. thrift. naturalised on old grave slabs in SM.
*Primula vulgaris* primrose. Common in KG.
*Lysimachia nummularia* creeping jenny. By the canal at Kensal Green (Trimen and Dyer 1869).
*L. punctata* perforated loosestrife. Naturalised north west of the Doric Temple.
*Anagallis arvensis* scarlet pimpernel. Common.
*Buddleia davidii* buddleia. Common.
*Fraxinus excelsior* ash. Widely naturalised. The fungus *Pholiata squarrosa* grows on the trunk of the old tree by the main entrance into KG.
*Syringa vulgaris* lilac. Widely naturalised.
*Ligustrum vulgare* privet. Scattered.
*L. ovalifolium* Japanese privet. Widely naturalised.
*Phillyrea latifolia* Well naturalised from plantings by Centre Avenue.
*Vinca minor* lesser periwinkle. Scattered south-west of Chestnut Avenue.
*Polemonium caeruleum* Jacob's ladder. A garden outcast by South Avenue.
*Symphytum officinale* comfrey. Scarce in SM.
*Myosotis sylvatica* wood forgetmenot. Spreading from graves along paths in KG.
*M. arvensis* common forgetmenot. Scarce by the western boundary wall of KG.
*Convolvulus arvensis* field bindweed. Common.
*Calystegia sepium* subsp. *silvatica* large bindweed. Common.
*C. sepium* subsp. *sepium* hedge bindweed. Less common than the above.
*Solanum dulcamara* bittersweet. Common.
*S. nigrum* black nightshade. Common.
*S. tuberosum* potato. Few on South Avenue tip.
*Verbascum thapsus* common mullein. Scattered.
*Antirrhinum majus* snapdragon. Common.
*Linaria purpurea* purple toadflax. Increasing by paths.
*L. vulgaris* common toadflax. Common.
*Chaenorhinum minus* small toadflax. Uncommon on SM tip.
*Cymbalaria muralis* ivy-leaved toadflax. Common.
*Digitalis purpurea* foxglove. One plant on a grave by South Avenue.
*Veronica chamaedrys* germander speedwell. Common.
*V. serphyllifolia* thyme-leaved speedwell. Fairly common in grassy places.

*V. arvensis* wall speedwell. Scarce on grave slabs. On an old grave by the main driveway into SM.
*V. hederifolia* ivy-leaved speedwell. Common, especially around boles of old trees.
*V. persica* common field speedwell. Common.
*V. polita* grey field speedwell. Scarce. On SM tip and on a garden grave by the main driveway into SM.
*V. filiformis* slender speedwell. Scarce by west Centre Avenue.
*Odontites verna* red bartsia. On waste ground by South Avenue.
*Thymus drucei* wild thyme. Naturalised on a grave slab by SM chapel.
*Prunella vulgaris* self heal. Common.
*Stachys sylvatica* hedge woundwort. Common.
*Ballota nigra* black horehound. Common.
*Lamium amplexicaule* henbit. Common.
*L. purpureum* red deadnettle. Common.
*L. hybridum* cut-leaved deadnettle. Uncommon in the south of KG.
*L. album* white deadnettle. Common.
*Glechoma hederacea* ground ivy. On lawns.
*Ajuga reptans* bugle. On lawns.
*Plantago major* great plantain. Common.
*P. lanceolata* ribwort plantain. Common.
*Campanula portenschlagiana* Adria bellflower. Well naturalised on the walls of a garden grave dated 1955 near the main entrance into KG.
*Galium mollugo* hedge bedstraw. Common.
*G. verum* lady's bedstraw. Common.
*G. aparine* cleavers. Common.
*Sambucus nigra* elder. Common.
*Viburnum opulus* guelder rose. By the southern entrance into Chestnut Avenue.
*V. tinus* laurustinus. Well naturalised by Chestnut Avenue.
*Symphoricarpos rivularis* snowberry. Common.
*Lonicera nitida* Chinese honeysuckle. Young shoots on South Avenue tip.
*Dipsacus fullonum* teasel. Common.
*Galinsoga parviflora* gallant soldier. Common.
*G. ciliata* shaggy soldier. Common.
*Senecio jacobaea* ragwort. One plant by SM chapel.
*S. erucifolius* hoary ragwort. Common in KG.
*S. squalidus* Oxford ragwort. Common.
*S. vulgaris* groundsel. Common.
*Tussilago farfara* coltsfoot. Common.
*Petasites fragrans* winter heliotrope. Common.
*Calendula officinalis* marigold. A frequent plant from dumped soil.
*Pulicaria dysenterica* common fleabane. Spreading slowly eastward from its stronghold in a privet copse near the western entrance into KG.
*Gnaphalium uliginosum* wayside cudweed. Scarce in SM.
*Solidago canadensis* golden-rod. Common.
*Aster* sp. Michaelmas daisy. Common.
*Conyza canadensis* Canadian fleabane. Common.
*Bellis perennis* daisy. Common.
*Achillea ptarmica* sneezewort. Thinly scattered in both cemeteries.
*A. millefolium* yarrow. The striking hoverfly *Volucella zonaria* has been seen feeding at yarrow flowers in mid-summer here.
*Tripleurospermum maritimum* subsp. *inodorum* scentless mayweed.
*Matricaria recutita* scented mayweed. Common.
*M. matricarioides* pineapple weed. Common.
*Chrysanthemum leucanthemum* ox-eye daisy. Common.
*C. vulgare* tansy. Common.
*Artemisia vulgaris* mugwort. Common.
*Arctium minus* lesser burdock. One plant by South Avenue railing.
*Cirsium vulgare* spear thistle. Common.
*C. arvense* creeping thistle. Many plants bear swollen stem-galls, the work of mining grubs of the dipteron *Euribia cardui*.
*Centaura nigra* knapweed. Common.
*Lapsana communis* nipplewort. Common.
*Hypochoeris radicata* catsear. Common.
*Leontodon autumnalis* autumnal hawkbit. Common.

*Picris echioides* bristly ox-tongue. Between Kilburn and Kensal Green (Trimen and Dyer 1869).
*Tragopogon pratensis* goatsbeard. Common.
*Lactuca serriola* prickly lettuce. Common.
*Sonchus arvensis* corn sowthistle. Common.
*S. oleraceus* smooth sowthistle. Common.
*S. asper* prickly sowthistle. Common.
*Hieracium lepidulum* hawkweed. Common. Other *Hieracium* species may occur.
*Crepis vesicaria* beaked hawksbeard. Common.
*C. capillaris* smooth hawksbeard. Common.
*Taraxacum officinale* dandelion. Common.

ANGIOSPERMAE: MONOCOTYLEDONES

*Polygonatum* × *hybridum* garden Solomon's seal. Scattered and increasing in KG.
*Asparagus officinalis* asparagus. Scattered and increasing in both cemeteries.
*Endymion nonscriptus* bluebell. Common.
*E. hispanicus* Spanish bluebell. Common.
*E. hispanicus* × *nonscriptus* hybrid bluebell. Occurs where the parents grow close together.
*Allium vineale* crow garlic. Scattered thinly in both cemeteries.
*Juncus bufonius* toadrush. By south Terrace Avenue on damp soil.
*Luzula campestris* field woodrush. Common.
*Galanthus nivalis* snowdrop. Sparingly naturalised by paths.
*Narcissus* sp. garden daffodil. Widely naturalised from grave plantings.
*Iris germanica* iris. A large colony has arisen from dumped rhizome fragments in the extreme west of SM.
*Crocus* sp. crocus. Widely naturalised in early spring in SM from grave plantings. Less so in KG.
*Tamus communis* black bryony. A few plants climb the Malcolm vault east of the Doric temple.
*Arum maculatum* cuckoo pint. By North Avenue west of the old colonnade.
*Carex divulsa* grey sedge. Scattered in grassland especially by paths.
*Festuca arundinacea* tall fescue. Scattered.
*F. rubra* red fescue. Common.
*Lolium perenne* perennial rye-grass. Common.
*Poa annua* annual meadow-grass. Common.
*P. compressa* flattened meadow-grass. On gravel paths.
*P. pratensis* smooth meadow-grass. Common.
*P. trivialis* rough meadow-grass. Common.
*Dactylis glomerata* cock's-foot. Common.
*Cynosurus cristatus* crested dog's-tail. Common.
*Zerna ramosa* hairy brome. Common.
*Anisantha sterilis* barren brome. Common.
*Bromus mollis* soft brome. Common.
*Brachypodium sylvaticum* false brome. Common.
*Hordeum murinum* wall barley. Common.
*H. vulgare* six-rowed barley. Common on SM tip in 1983.
*Avena fatua* wild oat. Common on SM tip in 1983.
*Arrhenatherum elatius* false oat. Common.
*Holcus lanatus* Yorkshire fog. Common.
*Agrostis stolonifera* creeping bent. Common.
*Phleum pratense* timothy. Common.
*Alopecurus pratensis* meadow foxtail. Common.
*Anthoxanthum odoratum* sweet vernal-grass. Common.
*Digitaria* sp. crab grass. A bird-seed alien in the crematorium rose garden.

## Acknowledgements

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## APPENDIX

## The past flora of Kensal Green

The following species recorded by Trimen and Dyer (1869) as occurring in Kensal Green Cemetery I have been unable to discover during the course of the present survey: *Draba verna* whitlow grass, *Malva neglecta* dwarf mallow and *Poterium sanguisorba* salad burnet (located originally in 1862).

Soon after arriving in the hamlet of Kensal Green, George Moreland painted his famous picture 'Children Nutting', which was engraved for popular distribution in 1788. Gladstone (1924) states 'It seems quite possible that the subject was suggested by the nutbushes which according to tradition, were plentiful all over the neighbourhood.' We may infer from this reference that in Morland's day *Corylus avellana* grew in the area of land which later came to be enclosed as Kensal Green Cemetery.

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# Book Review

*Lords Bushes: The History and Ecology of an Epping Forest Woodland.* By M. W. Hanson. *Essex Naturalist,* No. 7 (New Series). 1983. 69 pp. Essex Field Club, c/o Passmore Edwards Museum, London E15 4LZ. £3.30 (incl. postage). ISBN 0 905637 12 7.

Lords Bushes is a wood of 92 acres surrounded by housing except on one side where it is separated from buildings by Knighton Wood which is in fact the relic of a private park. It is hard to see how Mr. Hanson's account of this small area could be more comprehensive. He has been able to assemble plenty of evidence to show that anciently it was used as a wood-pasture, and to relate that to its very different modern character. There are very full accounts of the flora and fauna, including a list of 361 flies, one with the new name *Epicypta limnophila.* Several engaging line drawings and two of the photographs are also the author's work.

Why this booklet deserves close attention even from many who will probably never go near Lords Bushes is because of the consequences he describes of the major event in the recent history of the wood. In the very dry summer of 1976 all the leaf litter in the central half of it burned and smouldered for weeks on end, destroying the trees which had to start again from scratch included many plants characteristic of wet heath, the seeds of which must have been lying dormant in the soil for a very long time, and in the process the habitat for animals which had previously been rather uniform became very much more diverse. The inference to be drawn by the managers of many over-mature 'amenity' woodlands and overgrown commons may be somewhat difficult to convert into practical policies!

R. M. BURTON

# The Naturalization of Oil-milling Adventive Plants in the Thames Estuary

by J. R. Palmer*

## Summary

Oil-milling adventives germinate in Britain mainly from the weed seeds present in waste material accompanying imported oil seeds, in particular from soya bean waste. The oil-seed plants themselves can also occur as casuals e.g. oilseed rape, soya bean, castor-oil plant.

Habitats for these adventives include rubbish tips, the ground in and around oil milling factories and, in N. Kent at least, shores along the Thames estuary to which water-borne seeds have drifted, these latter being the concern of this paper. The number of drift-line records occurring is now very small, because of the marked decrease in the import of oil milling material to W. Kent, and the time seems appropriate to record the limited amount of naturalization which has taken place. No records are known from the Essex shoreline.

## Introduction

At least 85 foreign species have been recorded growing uncultivated in Britain as a by-product of the oil milling industry. (In addition a number of species not yet found in the wild in Britain have been raised artificially in gardens from oil-milling waste).

Many of the plants, being of North American origin, are hardier in Britain than other groups e.g., bird-seed aliens. Nevertheless the evidence of naturalization is comparatively small. In Kent dumping of oil-seed waste on rubbish tips ceased after 1977, and since then records have been confined almost exclusively to plants germinating (a) from wind-blown material in the vicinity of Erith Oil Works (not the concern of this paper) or, more extensively, (b) from water-borne seeds which have germinated after being cast up on estuarine shores. These latter, the oil-seed drift plants, have been observed as far away as Sheerness (V.C.15), which is the furthest east I have searched for them. The species found are limited to those whose seeds can withstand immersion, often prolonged, in brackish water, and the apparent run-down of the industry recently has resulted in a severe reduction in the number of sightings. Although various species have been observed along the drift line, only those set out below have attempted to establish themselves. Purely casual records from estuarine shores are set out in the Appendix.

## Naturalization in North Kent

*Amaranthus paniculatus* L.

This pigweed seems to have become established, at least for the present, on the river wall east of Cross Ness. It has also been seen on Erith Marshes. The spikes are pinkish in bud, and fox brown in colour when fully expanded, in the regressive form seen in this area.

*Helianthus annuus* L.

Sunflower is very much more abundant than any other drifted oil-seed adventive along the North Kent coast, and has in some years been almost continuous along the shore-lines where the growing conditions are suitable, though often small-sized. Many of these are without doubt the progeny of a previous year's flowering.

* 19 Water Mill Way, South Darenth, Dartford, Kent DA4 9BB.

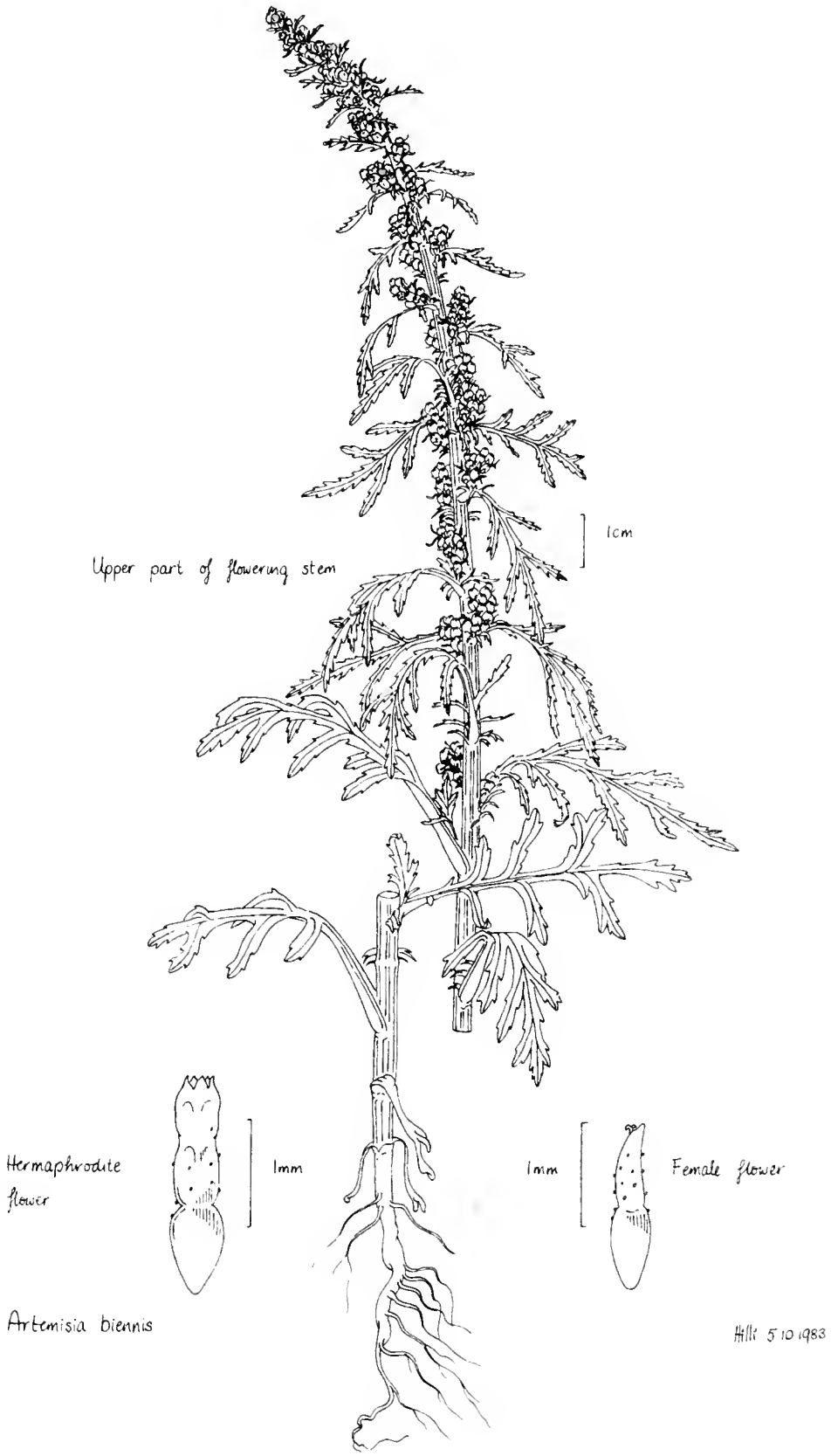


FIG. 1. *Artemisia biennis* Willd. Original drawing kindly loaned by Hilli Thompson.

*Artemisia biennis* Willd.

This attractive species (Figure 1) usually behaves as an annual in Britain, and can range in height from a few inches to over 6 feet. It seems to have become established to a limited extent from about 1981 onwards on the Thames river wall during the construction of the Woolwich flood barrier, when access to the riverside was restricted. A dozen plants were counted in the autumn of 1983.

*Xanthium strumarium* L. subsp. *italicum* (Moretti) D. Löve

Burweed has frequently been observed along the Thames, as single plants, spaced out at intervals all the way from Cross Ness to Allhallows-on-Sea. In addition it sometimes seeds itself, producing small colonies on beaches etc., most recently at Higham Marshes in October 1983. Some seeds undoubtedly fall into the water and are carried elsewhere.

*Ambrosia trifida* L.

Great ragweed is not as frequent as the last species along the shore, but again small colonies have been observed where it has seeded itself on beaches e.g., east of Denton.

*Iva xanthifolia* Nutt.

Prairie ragweed was observed to seed itself in 1979 on a beach at Greenhithe.

*Sorghum halepense* (L.) Pers.

Johnson grass, a hardy perennial, was established on the river wall at Erith Marshes until destroyed by Thames barrier works about 1982.

*Setaria pumila* (Poiret) Schultes

Foxtail bristle-grass has occurred in some quantity around the south beach on the Isle of Grain in 1980, indicating a degree of persistence.

*Hordeum jubatum* L.

Foxtail barley has persisted for a few years now on the river wall at Belvedere, near Erith Oil Works. It also occurs much further down river west of Allhallows-on-Sea where its mode of introduction is uncertain.

## APPENDIX

### *Casual oil-milling species seen growing from waterborne seed in the Thames estuary*

The following species have been observed only as casual adventives from oil-seed waste along the drift line on beaches in North Kent. No records are known from the Essex shore although it is likely that there have been a few occurrences on that side of the river.

| | | |
|---|---|---|
| *Sicyos angulatus* L. | Bur cucumber | Stone Marshes 1981 |
| *Ricinus communis* L. | Castor-oil plant | Greenhithe 1981 |
| *Ipomoea hederacea* Jacq. | Ivy-leaved morning glory | Jenningtree Point 1981 |
| *Lappula squarrosa* (Retz.) Dumort | Bur forget-me-not | Greenhithe 1979 |
| *Datura stramonium* L. | Thorn-apple | Jenningtree Point 1980 |
| *Ambrosia artemisiifolia* L. | Ragweed | Jenningtree Point 1979, 1980 |
| *Silybum marianum* (L.) Gaertn. | Milk-thistle | Higham Marshes 1983 (may persist) |
| *Setaria viridis* (L.) Beauv. | Bottle-grass | Sheerness-on-Sea 1981 |

# Size Distribution of Timber Trees in the Ruislip Woods, Middlesex in the Seventeenth and Nineteenth Centuries

by E. M. Bowlt* and C. Bowlt*

## Summary

Three documents in the archives of King's College, Cambridge list the values of individual timber trees to be felled in Copse Wood, Ruislip in the years 1678, 1679 and 1680. The tree sizes derived show a medieval type of size distribution with most trees containing less than six cubic feet ($0.17m^3$) of timber.

A further document lists the volumes of timber trees marked for felling in Copse Wood and Park Wood, Ruislip in 1807 and indicates that a typical medieval size distribution still existed in Ruislip Woods at that date with few trees having diameters greater than nine inches (23 cm). This is compared with a modern sample from Park Wood with diameters ranging from 12.5 inches to 28 inches (32–71 cm).

The implications for the natural history in such woodlands is discussed.

## Introduction

The structure and composition of woods in the past is of interest not only to botanists and ecologists interested in the historical development of our flora and fauna, but also to local historians concerned with the exploitation and management of woods and the construction of timber-framed buildings. The size distribution of the standard or timber trees reflects the intensity of tree management. Rackham (1981) showed, mainly on evidence from building timbers, that, in a typical medieval wood, oaks varied in size and age but mainly were very young. Turnover was rapid and irregular, trees being felled and used as roughly squared whole or halved trunks of 25-70 years growth (Rackham 1976). Medieval building timber evidence strongly suggests that few large trees were present in medieval woods.

It is interesting to compare the sizes of timbers used in the Roman Thames waterfronts with those in the waterfronts of the eleventh and twelfth centuries as revealed in recent archaeological excavations. At the Custom House site the second century Roman waterfront contained timbers with 100-213 growth rings, whereas medieval waterfront timbers from the same site had fewer than 75 rings. This difference is observed at other sites, but planks from larger trees occur in a few sections of twelfth century waterfront (Morgan 1977).

In the sixteenth and seventeenth centuries buildings began to be constructed from larger trees sawn lengthwise in many pieces. In the eighteenth century woodland oaks were still small but some evidence indicates that their size increased during the century (Rackham 1981). The purpose of this paper is to present data which strongly suggest that no such increase took place in the Ruislip Woods in north-west Middlesex and that tree sizes remained small until at least the beginning of the nineteenth century.

## The Woods

Park and Copse Woods were part of the Manor of Ruislip held by King's College, Cambridge from 1451 until they were sold to Ruislip-Northwood Urban District Council and Middlesex County Council in 1932 (Park Wood) and 1936 (Copse Wood).

*7 Croft Gardens, Ruislip, Middlesex HA4 8EY.

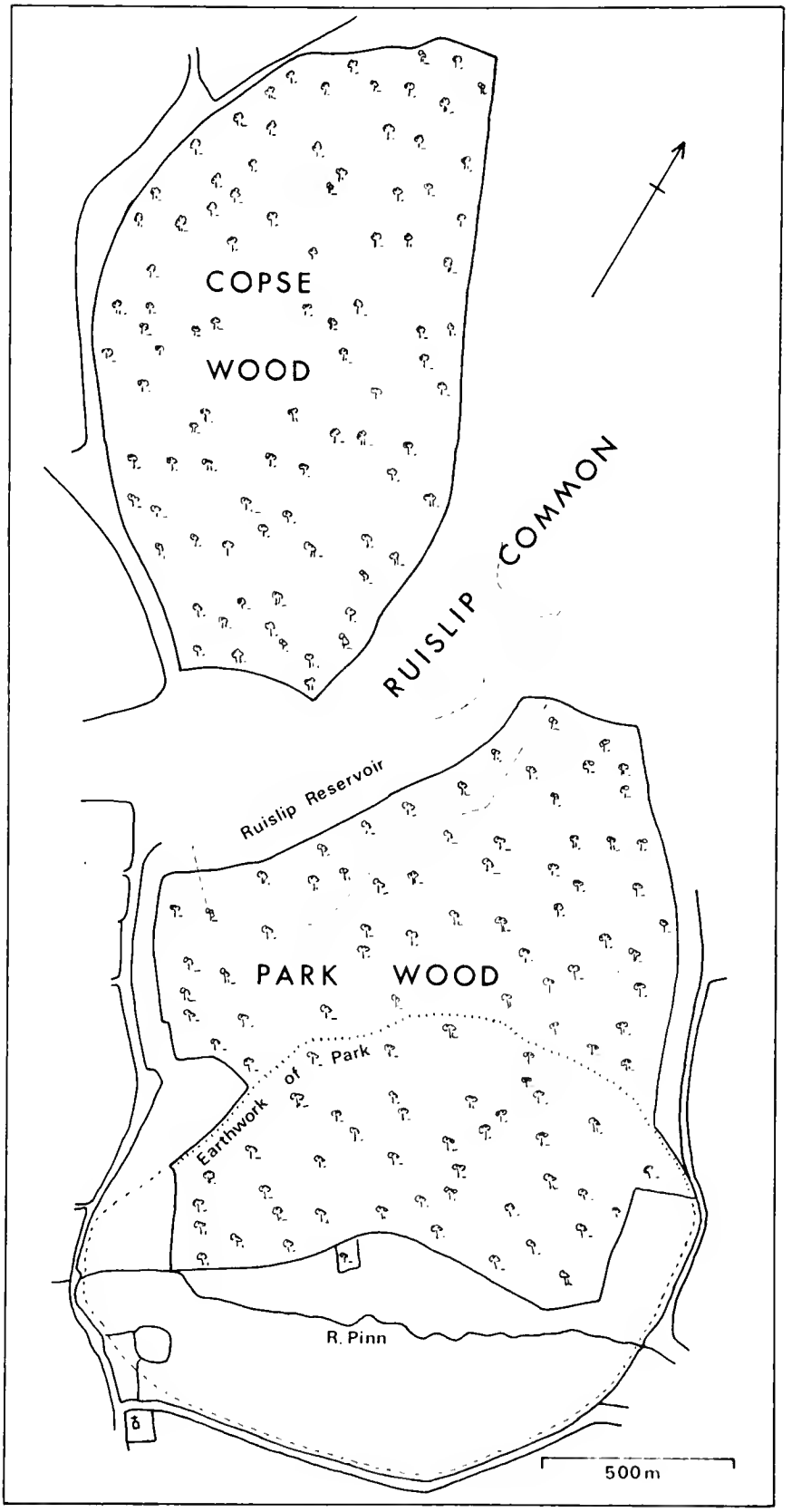


FIG 1. Copse Wood and Park Wood, Ruislip in 1750 (based on Doharty, K. Coll. Mun.)

Ruislip had a Park for woodland beasts mentioned in Domesday Book. Such a Park was ordered to be stocked with five live does from Harrow Wood in 1270 (Morris 1950). A broad eroded bank with outer ditch of some 30-35 ft in total width and still traceable, shows the original northern boundary of the Park, while slightly less massive earthbanks (20-25 ft) leading north towards a stream, suggest that the Park enclosure was increased in the later medieval period (Figure 1). Palings were repaired in 1435-6 (Morris 1980). By 1565 the Park contained 358 wood acres (426 acres statute measure) (King's College Muniments, R 36), including most of what is now Ruislip Reservoir (created after Ruislip Enclosure 1806 to be a feeder for the Grand Junction Canal). The portion of the ancient Park which lay along the River Pinn had become meadow land attached to Manor Farm (K.C. R 36; fol.23). There is no reason to suppose that it was being managed as a Deer Park at that time, or at any later period, nor that its seventeenth century structure was affected by medieval wood pasture management. The area north of the Park was known as the Outwood in the fifteenth century (Morris 1980) being outside the enclosed Park, and as the Common Wood or 'A Great Wood called Ruislip Wood' in the sixteenth century (K.C. R36; fol.42) and the Common Wood by the eighteenth century. Copse Wood appears to have been enclosed out of the Common Wood about the year 1608 when Robert Cecil, First Earl of Salisbury, Manorial lessee, sold all the trees on the remaining 568 wood acres of it leaving open common land (an eighteenth century footnote in K.C. R 36; fol.42). Cecil's enclosure of common land may have been permitted because he enjoyed the support of an influential senior of the College (Hist.M/S Commission, Series 9, vi, Pt. VI).

It is important to understand the difference between enclosed wood which is managed to produce timber and underwood and common wood where grazing was permitted to manorial tenants, thus restricting tree growth. There were some minor clearances round the edges of both woods at a later date, but the pattern of woodland in Ruislip was set at the beginning of the seventeenth century and remained until the suburban development of the past sixty years.

Both woods consist mainly of coppiced hornbeam *Carpinus betulus* with standard oaks *Quercus robur*. They appear to correspond to the 'pure hornbeam woods' type of Rackham (1981). Some parts of Park Wood have considerable amounts of *Q. petrea* both as standards and a small amount of relict coppice which are perhaps closer to Rackham's 'oak-hornbeam woods' type. The botanical structure of the woods has been described by Mitchell (1951, 1954) and surveys published of the flora (Wrighton 1979) and of the bryophytes (Gardiner and Bowlt 1983). Additional information on the history, past management and natural history is given by Bowlt and Bowlt (1982).

## Past Management

Timber and underwood were managed in different ways. The hornbeam underwood was coppiced on about a fifteen-year rotation from the fifteenth to the nineteenth centuries to provide thin poles and firewood, while the oaks were left to produce timber of larger dimensions suitable for building construction (K.C., Q42/26). However, seventeenth century King's College documents suggest that few oaks were allowed to become very large trees, but were felled after 30-40 years growth within the enclosed woods. A letter written to the Provost of King's College in May 1692 by Ralph Hawtrey of Eastcote House (K.C., Q42/40), then lessee, shows that oaks were allowed to regenerate from coppiced stools. 'It hath been the constant usage tyme out of minde..., to leave standing at the felling of any wood all the young and little stores of oak be they never so small and likewise one steem upon most oaken stubbs, which in all probability stands while they are 30 or 40 years growthe, before they come to be felled in their course...'. Probably a stem from a stool would grow more quickly than from an acorn.

All leases of the woods after 1543 make reference to the Parliamentary statute of that year aimed at preserving large timber trees, whereby twelve storiers or standels (young trees left standing for timber) had to be left upon every acre.

## Timber Accounts and Analysis

Among the archives of King's College three documents (Q37, Q38, Q39) list the values of individual trees to be felled in Copse Wood in the years 1678, 1679 and 1680. These are summarized in Table 1. A further document (Q42/83) lists volumes of individual trees marked for felling in 1807 in Copse Wood and Park Wood. These are summarized in Table 2. The number of trees listed must have represented a small fraction of the total timber trees standing so that it is not possible to estimate the density of growing trees.

The seventeenth century accounts list the value of each tree. Rackham (1981) gives the prices of oak trees per cubic foot since the fourteenth century. Although his data derive from eastern England it seems not unreasonable to assume that prices at Ruislip were similar, particularly since the woods belonged to a Cambridge College. The mean price of oak trees in 1680 was 10d per cubic foot (prices are as listed where 240d=£1) and this figure has been used to convert the listed values to volumes of timber. The distribution of tree sizes for the combined years 1678-80 is shown in Figure 2. It is seen that most trees were of less than six cubic feet, but with a few as large as 16 cubic feet in volume (1 cubic foot = 0.0283 $m^3$). Rackham (1981) states that the oaks used in medieval buildings usually contain less than 12 cubic feet; a good-sized modern oak contains about 40 cubic feet and a large one 100 cubic feet.

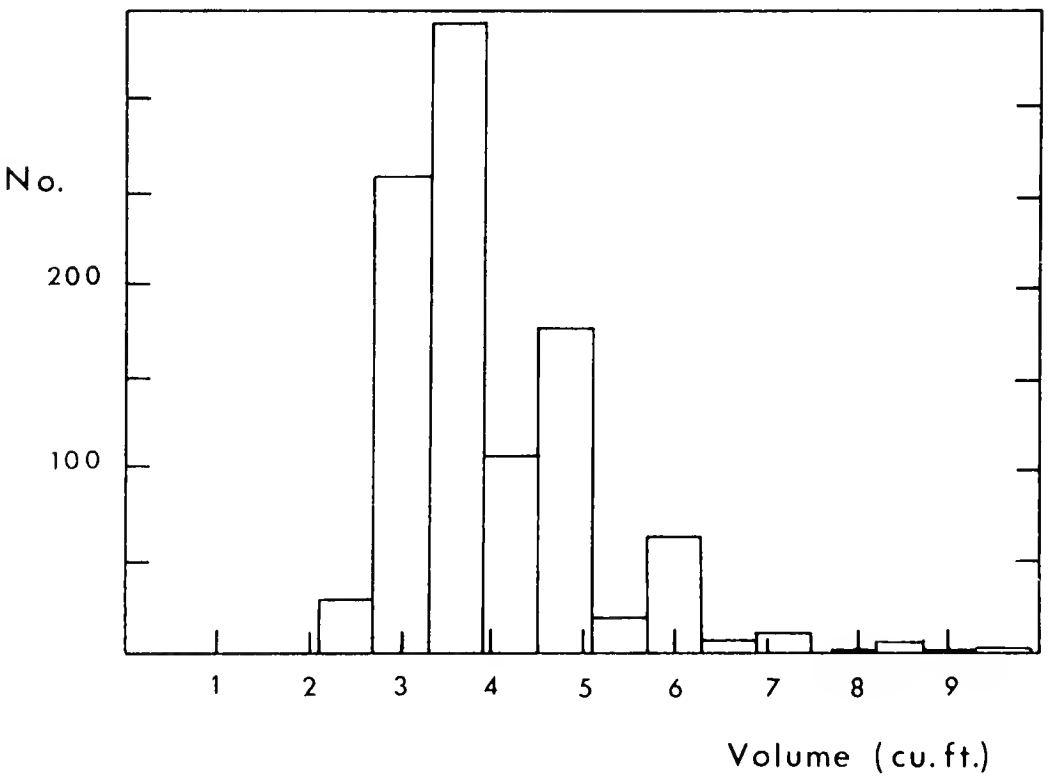


FIG 2. Distribution of timber volumes of trees felled in Copse Wood, 1678-80.

| Value (s/d) | 2/0 | 2/6 | 3/0 | 3/6 | 4/0 | 4/6 | 5/0 | 5/6 | 6/0 | 6/8 | 7/0 | 7/6 | 8/0 | 9/0 | 10/0 | 13/0 | 13/4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number of trees | 31 | 260 | 346 | 107 | 176 | 19 | 63 | 6 | 11 | 1 | 6 | 1 | 2 | 1 | 2 | 1 | 1 |
| Vol. (cu. ft.) | 2.4 | 3.0 | 3.6 | 4.2 | 4.8 | 5.4 | 6.0 | 6.6 | 7.2 | 8.0 | 8.4 | 9.0 | 9.6 | 10.8 | 12.0 | 15.6 | 16.0 |

TABLE 1. Valuation of trees (in shillings and pence) felled in Copse Wood, Ruislip during 1678-80 and the derived timber volumes.

| Volume (cu. ft.) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Copse Wood — oak | 966 | 862 | 487 | 158 | 30 | 15 | 4 | 3 | 1 | 3 | 0 | 0 | 1 | 0 |
| Copse Wood — beech and ash | 44 | 58 | 43 | 0 | | | | | | | | | | |
| Park Wood — oak | 82 | 131 | 129 | 96 | 61 | 35 | 14 | 7 | 2 | 2 | 1 | 0 | | |
| Park Wood — beech and ash | 1 | 11 | 17 | 21 | 0 | 5 | 0 | | | | | | | |
| Inclosed land — oak | 0 | 1 | 2 | 5 | 2 | 5 | 3 | 7 | 7 | 3 | 0 | 1 | 0 | 2 |

| Volume (cu. ft.) | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
|---|---|---|---|---|---|---|---|---|
| Inclosed land — oak (hedgerow trees) | 0 | 3 | 0 | 1 | 1 | 3 | 1 | 1 |

TABLE 2. Numbers of trees of given volume marked to be felled in Copse Wood and Park Wood, Ruislip in 1807. Trees from fields also shown.

The valuations for Copse Wood would seem to show that a medieval range of tree sizes persisted in the late seventeenth century assuming that no size selection was made by the valuers (i.e. that the surveys were random samples). This point needs to be borne in mind since the surveys for 1678 and 1679 refer to the 'unthriving' and 'unthrifty' timber respectively. The 1680 valuation simply refers to 'timber' but the range of sizes is not significantly different from the previous years.

The document for 1807 offers no such qualification about the status of the timber, being simply entitled 'Account of Timber marked to fell in King's College Coppice and Park Woods at Ruislip.' The sizes of individual trees are measured in cubic feet. The distribution of tree sizes is shown in Figure 3. Most trees to be felled in both woods had a volume less than six cubic feet and the account gives no indication that timber trees were being allowed to grow larger. Assuming the 3290 trees to be a representative sample, the data show that a typical medieval distribution still prevailed in Ruislip Woods at the beginning of the nineteenth century.

It is interesting to compare the trees felled in the woods with those on enclosed farmland, also shown in Table 2. Even this small sample of 48 trees included a tree of 22 cubic feet. In general hedges and fields contained and still contain larger trees than woodland. The volume of timber referred to in the accounts is the volume of the trunk usable for larger structures in the form of beams, planks, etc. The rest of the tree was classified as wood suitable for firewood. Using a few reasonable assumptions it is possible to derive limiting values for height and girth dimensions. The volume of timber ascribed to a trunk by the Hoppus method is given by $(\frac{1}{4} \times \text{girth})^2 \times \text{length}$, and has been known since at least the sixteenth century. This is the volume of the squared log but with rounded corners. If estimates of volumes are made from measurements of trunks with bark on (over bark measurements) allowance must be made for the thickness of the bark. For oak this means that about 18% has to be deducted from the over-bark measure of a log's volume in order to estimate the under bark volume of usable timber (Schwankl 1956).

In the 1678-80 valuations most trees fell in the 3.6 cubic foot class (under bark). For girth of two feet (7.6 inches diameter), below which trees are not usually considered to be timber, the length of useful trunk would be 17.6 feet. If the trunk was as short as 12 feet (probably minimum useful length as timber) the diameter of the trunk would be 9.25 inches. Even the largest tree probably had a diameter in the range 12 inches (for a length of 30 feet — hardly likely to be more) to 15 inches (for a length of 20 feet — hardly likely to be less).

In the 1807 survey most trees had a volume of less than 6 cubic feet (under bark). For a length of 20 feet, trees with this volume would have a diameter of 9.2 inches. It is interesting to note that in this survey trees with usable volume of only 1 cubic foot (under bark) were included as timber. If these had a girth of two feet then the trunk length equalled 4.8 feet, or if the trunk length was 12 feet then the diameter was 4.8 inches. Either way it hardly seems to classify as timber.

## Discussion

The timber valuations of 1678-80, with the above reservations, indicate that the trees growing in Copse Wood were maintained as a very young population. This is thought to have been the usual situation in medieval managed woods, a practice which gradually gave way to the encouragement of larger trees. It is therefore of particular interest to find an equally young population of trees being maintained as late as 1807 in both Copse Wood and Park Wood. At both periods few trees appear to have had diameters greater than nine inches. The absence of large trees in both these earlier periods contrasts with their present occurrence. Although the tree population is still comparatively young, with no gnarled oaks, many have

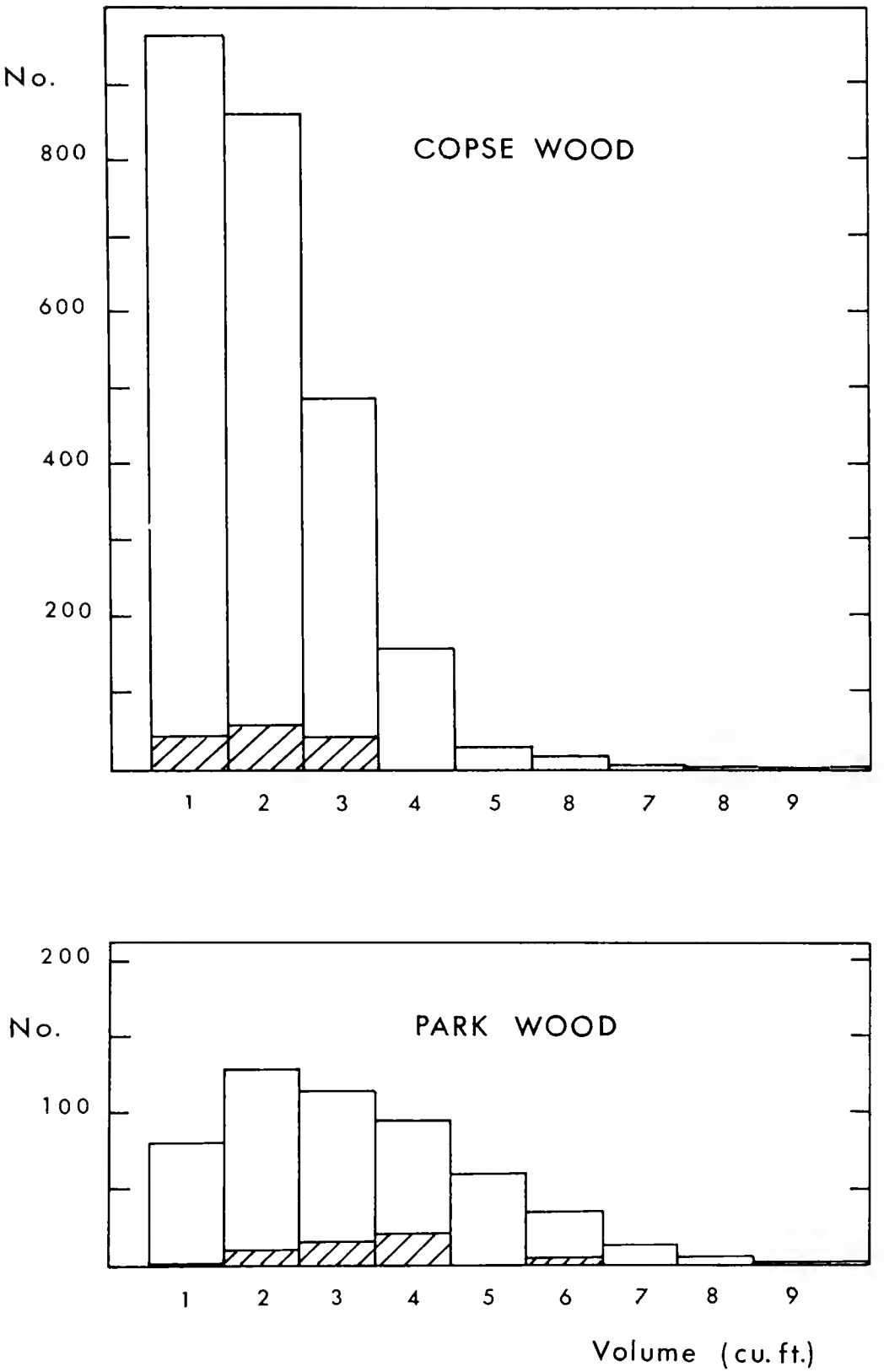


FIG 3. Distribution of timber volumes of trees felled in Copse Wood and Park Wood in 1807. Beech and ash indicated by hatching.

diameters greater than nine inches. Measurements of a typical sample in Park Wood, which would now be deemed suitable for timber had diameters ranging from 12.5 inches to 28 inches (at five feet above the ground) with a mean diameter of 16.9 inches.

It is generally considered that the semi-natural ancient woodland in Britain is one of the more stable habitats. Periodic coppicing and timber felling are assumed to create only local oscillations about some mean situation through which woodland plants and animals can survive and in some cases are probably necessary for continued survival. It is also frequently assumed that because of this stability ancient woods are valuable reserves of wildlife existing and interacting in a relatively natural manner, some of which would not survive the destruction of such woodland. It seems to be fairly well established for instance, that certain species of lichens (Hawksworth *et al.* 1974) and beetles (Hammond 1974) are restricted to sites which have had a continuous woodland cover for many centuries and can act as old forest indicators.

The historical evidence shows that the Ruislip Woods are certainly ancient woods (apart from two areas of secondary woodland resulting from nineteenth century clearance) but the lack of large trees in both the seventeenth and nineteenth centuries, which the data presented in this paper seem to show, raises some interesting implications for the natural history of the woods during the past centuries. For instance, birds such as the woodpeckers would have found rather limited facilities for feeding and breeding. Hole-nesting birds generally would probably have had rather restricted opportunities, though this might have been alleviated somewhat by nesting in old coppiced stools as is occasionally observed now. The effect on other animals, such as the red squirrel (which was present until the 1930s) can only be guessed.

At present it is not known how many other old woods were maintained with a small tree size distribution into the 19th century. The full ecological implications of different tree size distributions in woodland, both for the present and during times past, have yet to be investigated, but Elton (1966) has indicated how wide ranging and complex these are likely to be.

## Acknowledgement

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# The Ecology of the Freshwater and Saline Ditches on Crayford and Dartford Marshes, Kent

by Brian Knights* and Colin Powlesland*

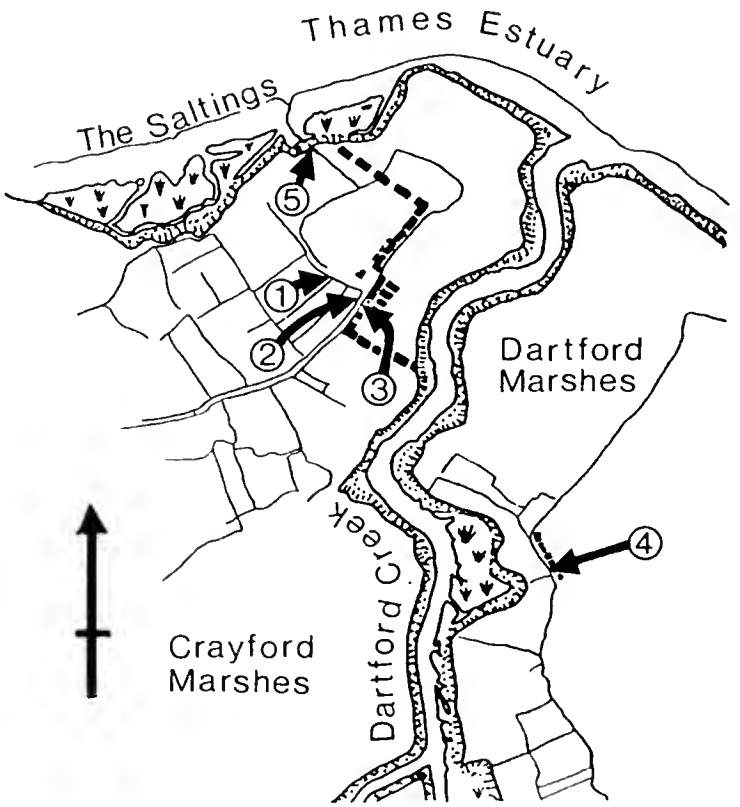

## Summary

The biota and physiography of the ditches on Crayford and Dartford Marshes were typical of various stages in the succession of the hydrosere and the drainage system. The saline influence of the Thames Estuary was marked at one study site, had lesser effects at three others and minimal effects on the fifth. The more stagnant the ditches, the lower their stability, floristic diversity and the number of ecological niches available. Hence they supported a lower faunal diversity although high eutrophication encouraged high abundances of a few tolerant species. Molluscs, gammarids and chironomids were generally dominant but faunal diversity was increased greatly in summer and autumn by species of air-breathing and flying Coleoptera and Hemiptera and exchange of euryhaline species with the Thames. Weed clearance in some ditches halts succession but recolonisation is rapid. There was little evidence of pollution stress. If the Marshes are developed in the future, drainage would have to be maintained and if the ditches were managed sympathetically, their ecology would not have to change drastically.


## Introduction

Crayford and Dartford Marshes lie west and east respectively of Dartford Creek (formed by the confluence of the Rivers Cray and Darent) and are bordered on the north by the Thames at Crayford Ness, some 30 km downstream of London Bridge (Figure 1). Crayford Marshes fall within the Greater London Council

Fig. 1. Map of study area showing sampling stations.

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boundary and Dartford Marshes within the County of Kent, both forming part of the Metropolitan Green Belt. They comprise mainly coarse grazing on reclaimed tidal marshland, protected by banks on the river frontage. They have an underlying chalk base overlain with gravel and then peaty alluvium intersected by interconnecting drainage ditches ranging in age from the fourteenth century to the present. The main ditches draining to the Rivers are maintained by the Greater London Council (G.L.C.) and Southern Water Authority (S.W.A.) to the west and east of the Creek respectively. The more inland southerly parts drain partly into the Creek, the lower northerly levels run through tidal-sluices into the Thames. The sluices are relatively new, being integral parts of recent improvements in Thames flood defences.

Present development in the north of Crayford Marshes comprises a scrapyard, warehousing and factories. The area northeast of the dotted line in Figure 1 is designated for further industrial development in the Bexley Plan (Bexley Borough Council 1981). The rest of the Marsh has been the subject of controversies regarding plans for further urban, industrial and amenity development (including a golf course, nature walk, rural studies centre and a marina on the Thames foreshore just upstream of Crayford Ness). On Dartford Marshes, present buildings are limited to a farm, a fireworks factory and a hospital.

Freshwater stretches of the Darent and Cray are sampled regularly by T.W.A. (Aston and Andrews 1978) and the Cray, Ruxley Gravel Pits and Five Arches Lake have been studied by Chubb (1965), Bailey (1973 and 1977) and Knights *et al.* (1980). The tidal Thames has been studied by Andrews (1977), Andrews and Rickard (1980), Andrews *et al.* (1982) and Knights and Cunningham (1983). The last also studied Dartford Creek but little is known about the ditches on the bordering marshes. Lambert (1930) has published information on the aquatic fauna of the salt marshes on the Essex shores seawards of Benfleet and one of the present authors (C.P.) is currently studying the ditch fauna on Pitsea Marshes, Essex, but the only directly relevant information on the marshes near Dartford is that published by Andrews (1977). He observed the prawn *Palaemonetes varians* living in association with the freshwater mollusc *Lymnaea peregra*, dytiscid beetle larvae, coenagrid dragonfly larvae and naid worms. This interesting range of species suggested a more detailed study would be of value and allow comparison with nearby aquatic ecosystems. Furthermore, the ecological value of the ditches was considered worth assessing in relation to present and possible future utilisation of the Marshes.

## Methods

### *Study Sites*

Initial surveys in late summer 1979 indicated that there were five major categories of aquatic habitat related to drainage patterns and saline influence and also in some respects to a natural succession pattern. Thus each of the biotic communities chosen represents a seral stage in the succession as ditches, if unmanaged, would become choked with vegetation and silt and relative levels would rise until they eventually reached a terrestrial climax. Some older and higher marsh areas have reached climax, but weed clearance and dredging to maintain drainage has arrested succession in other ditches. High water table levels arise from rainfall, sub-soil seepage from the Thames and Creek and infiltration of estuarine water through the sluices at high tide. Problems have been exacerbated by drying and shrinking of the marsh alluvium and by the relative rises in sea level over the last century or so (Knights 1979). Ditch water levels are now some 3-4 m below average high tide level and even greater differences would occur if the Thames and Dartford Creek Barrages had to be closed in the future against a storm-surge tide. All the five study sites, chosen for convenience of access (Figure 1), were open ditches, 1.5-2 m or more wide at the top and dug to 1.5-2 m below marsh level; all except Station 5 contained thick layers of anaerobic silt and organic debris.

**Station 1** was representative of a bog-like stage in the hydrosere, containing very shallow stagnant water and dominated by reeds *Phragmites communis*.

**Station 2** was dominated by mats of floating duckweed *Lemna minor*, the extent of surface coverage varying with movement by winds. Water was about 20 cm deep, depending on rainfall and stage of tide, but there was no detectable flow.

**Station 3** showed a slight eastward flow (average 3.5 cm $sec^{-1}$) but water depth was usually only about 10 cm. It was dominated at various times by attached Canadian pondweed *Elodea canadensis*, starwort *Callitriche* sp. and water cress *Nasturtium officinale*, plus occasional late summer blooms of blanket weed, *Cladophora* sp. Emergent vegetation at the margins mainly comprised *Iris pseudacorus*.

**Station 4** on Dartford Marshes contained about 20 cm depth of water with a variable flow (5 cm $sec^{-1}$ on average). This was usually fast enough in the centre to scour the bottom and expose the underlying gravel whilst leaving a fringe of emergent vegetation (mainly *Iris pseudacorus*). This ditch drained a fairly large inland and freshwater catchment area, a type rare on Crayford Marshes.

**Station 5** was near to the tidal sluice at Crayford Ness; water was 10-20 cm deep but the level, rate of flow and salinity fluctuated widely, depending on the stage of the tide and whether the sluice gate was open or closed. No aquatic vegetation occurred, other than dense mats of salt-tolerant *Zannichellia palustris* and *Cladophora* sp. in mid to late summer. Effluents from drains from the Thames embankment were often high in ferric salts and muds close to the sluice were often red with precipitated ferric hydroxide.

### *Physicochemical factors*

Like other shallow, eutrophic and still waters, ditches might be expected to show large variations in temperature, dissolved oxygen (DO) and other parameters such as pH on a diurnal and seasonal basis. These are due primarily to variations in air temperature, solar warming and the balance between plant photosynthesis and bacterial and plant respiration (Knights *et al.* 1980; Caspers and Heckman 1981). Floating stands of *Lemna* sp. are potentially of great importance because they reduce oxygen transport through the water surface and prevent the growth of submerged plants whilst the oxygen they produce in photosynthesis is released directly to the atmosphere (Marshall 1981; Clare and Edwards 1983). To study gross seasonal variations, air and water temperatures, DO and salinity, were measured at each Station in the morning once a month over a year (November 1979 to October 1980) using the methods of Knights *et al.* (1980). Three-monthly and annual averages are shown in Table 1. Measurements were also taken over 24 h in mid-summer to assess possible extreme diurnal ranges (Table 2).

### *Sampling of aquatic macroinvertebrates and vertebrates*

Sampling at each visit was as quantitative as conditions allowed; two parallel one-metre sweeps were made through the water with a 24 cm square F.B.A. net (8 meshes $cm^{-1}$) at a depth sufficient to also scoop up the first few centimetres of the substratum. This was followed by one minute's general netting over one square metre.

## Results

### *Temperature, DO and salinity*

Water temperatures tended to lag behind air temperatures (Table 1a) because of overnight cooling and slow solar warming. Stations 1 and 5 were more open to early morning sun and generally showed the higher temperatures. Wide

TABLE 1. Three-monthly averages for morning temperatures, DO and salinity at each Station (November 1979 — October 1980).

| Station Number | Nov.–Jan. | Feb.–April | May–July | Aug.–Oct. | Annual average |
|---|---|---|---|---|---|
| **(a)** | | **Average water temperatures (°C)** | | | |
| 1 | 4 | 7 | 20 | 17.5 | 12 |
| 2 | 4 | 6.5 | 17.5 | 15.5 | 11 |
| 3 | 3.5 | 6.5 | 18.5 | 17 | 11.5 |
| 4 | 5 | 8 | 15.5 | 15 | 11 |
| 5 | 4 | 8 | 21 | 17.5 | 13.5 |
| (Air temperature) | (7.5) | (7.5) | (20) | (16) | (13) |
| **(b)** | | **Average DO (% saturation)** | | | |
| 1 | 70 | 81 | 103 | 69 | 80.5 |
| 2 | 39 | 57.5 | 106 | 56 | 64.5 |
| 3 | 21.5 | 28.5 | 59.5 | 60 | 42.5 |
| 4 | 45 | 74 | 69.5 | 52.5 | 60 |
| 5 | 59 | 77.5 | 49.5 | 60.5 | 61.5 |
| **(c)** | | **Average salinity (‰)** | | | |
| 1 | 1.5 | 4 | 2 | 2.5 | 2.5 |
| 2 | 1.5 | 4.5 | 2 | 3 | 3 |
| 3 | 1 | 4.5 | 2 | 2.5 | 2.5 |
| 4 | 1 | 2 | 1 | 1 | 1 |
| 5 | 2.5 | 12 | 4 | 10 | 6.5 |

TABLE 2. Temperature and dissolved oxygen readings over 24h, 30-31 August 1980.

| Time (hrs) | Station Number 1 | 2 | 3 | 4 | 5 | Air Temperature |
|---|---|---|---|---|---|---|
| **(a) Temperature (°C)** | | | | | | |
| 12.00 | 24 | 19 | 21 | 17.5 | 22 | 21 |
| 21.00 | 27 | 28 | 27.5 | 19 | 30 | 24.5 |
| 6.30 | 17 | 17 | 17.5 | 17.5 | 17.5 | 18 |
| **(b) DO (% saturation)** | | | | | | |
| 12.00 | 85 | 75 | 60 | 70 | 64 | |
| 21.00 | 110 | 131 | 105 | 93 | 103 | |
| 6.30 | 23 | 5 | 42 | 82 | 5 | |

fluctuations can occur in summer (e.g. a range of 10-12.5°C over 24h, Table 2a) and in winter, freezing over is possible as witnessed by the fringes of ice seen on some visits.

DO also varied widely, the water tending to become supersaturated on summer days due to photosynthetic oxygen production and then falling very low at night due to oxygen utilisation, especially by bacteria (Tables 1b and 2b). Variations in DO were greatest at the more eutrophic sites, especially at Station 2 where the dense *Lemna* layer reduced oxygen exchange and equilibration with air. The converse was true of the cleaner and more lotic Station 4; the results compare well with those for lotic and lentic regions of the River Cray (Knights *et al.* 1980).

Salinity varied most at Station 5 (1.5-15.6‰) because it was affected on some visits by seepage of estuarine water through the sluice at high tide. Stations 1, 2, 3 and 5 were sited on interconnecting ditches nearer to the Thames and were more prone to saline flooding and sub-soil salt intrusion than the more inland Station 4 (Table 1c). Salinity patterns were further complicated by freshwater inputs via precipitation; low salinities in July, August and October, 1980, for example, definitely appeared to correlate with preceding heavy rainfall.

In conclusion, it can be seen that the ditch biota are subject to wide and stressful variations in environmental conditions on a tidal, diurnal and seasonal basis, Station 4 being the most stable site, Station 5 the least stable.

### *Macroinvertebrate distribution, diversity and abundance*

Much variation occurred from month to month (and probably over shorter time scales) in correlation with the above environmental factors. Data are therefore tabulated for simplicity in Table 3 as a species list together with the total numbers of individuals found per Station over the whole year and the total number at all Stations in each season.

A total of 67 macroinvertebrate species were identified, the Coleoptera, Hemiptera and Gastropoda being particularly well represented. Diversity and abundance was highest in summer and autumn and Station 4 showed the highest diversity, Station 5 the lowest.

**(i) Annelida**

Three species of carnivorous leech were found at Station 4 but this included only one *Helobdella stagnalis*. Leeches are typical of such moderately eutrophic water, as is the case for the River Cray (Knights *et al.* 1980). Other sites were too anaerobic and silty and possibly too saline and also lacked the diversity and abundance of their preferred prey, i.e. molluscs and, especially in the case of *Helobdella stagnalis*, tubificids and related oligochaetes. Densities were highest in April 1979.

The lack of oligochaetes other than *Nais* sp. at all sites is perhaps unusual but tubificids are not present on Pitsea Marshes either (Powlesland, unpublished results*). Chironomids are numerous on both marshes, however, and since they occupy a similar burrowing and filter-feeding niche, they may have displaced oligochaetes, as noted at times in the River Cray by Knights *et al.* (1980). The reverse was found in ditches near the River Elbe in Germany by Caspers and Heckman (1981). Naids could not be counted because they formed tangled fragile chains but were relatively most numerous at Stations 3, 4 and 5 in autumn.

**(ii) Mollusca**

Although 13 gastropod and two bivalve species were found, only *Lymnaea peregra* and *Potamopyrgus jenkinsi* were abundant in ditches other than Station 4. Five species of gastropod and the bivalve *Pisidium* sp. were indeed found only at Station 4, probably because the faster flow reduces siltation and maintains DO and the dense fringing emergent vegetation offers a variety of ecological niches. The prosobranch *Bithynia tentaculata* was the most numerous mollusc species at Station 4 although it was absent in the winter. It grazes epiphytic algae and dead vegetation and like some other non-pulmonates, is not very tolerant of low oxygen. Some competition may occur between this and other species because the planorbids, lymnaeids, valvatids and even *Bithynia leachii*, to a lesser extent, tended to be more numerous in autumn and winter.

The pulmonate *Lymnaea peregra* was abundant in the more eutrophic ditches; it is typical of such waters, being hermaphroditic and capable of crawling out of the water and breathing air to avoid extreme water conditions. *Potamopyrgus (Hydrobia) jenkinsi* is a prosobranch secondarily adapted to breathing air and capable of parthenogenesis and it tended to show abundances inversely related to those of *L. peregra*. Both species graze on epiphytic algae, bacteria and decaying vegetation and inter-specific competition probably occurs. Salinity tolerance may also be important, *P. jenkinsi* having invaded fresh water from brackish environments since the 1880s (Jenkins 1891) and being capable of breeding in salinities of below $5^0/_{00}$. Hemingway (unpublished results) has shown that *L. peregra* can tolerate 22 h exposure at $9^0/_{00}$, but continuous or fluctuating salinity

*Now published; see references.

TABLE 3. Species and total numbers of individuals found at each Station between November 1979 and October 1980, together with their seasonal abundance (pooled data for all Stations).

| | *Annual total no. of individuals collected at Station number* | | | | | *Total number of individuals collected per season* | | | | *per year* |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | Nov.–Jan. | Feb.–April | May–July | Aug.–Oct. | |
| ANNELIDA | | | | | | | | | | |
| HIRUDINEA | | | | | | | | | | |
| *Glossiphonia complanata* | — | — | — | 25 | — | 3 | 17 | 3 | 2 | 25 |
| *Helobdella stagnalis* | — | — | — | 1 | — | — | — | 1 | — | 1 |
| *Erpobdella octoculata* | — | — | — | 23 | — | 6 | 14 | 1 | 2 | 23 |
| OLIGOCHAETAE | | | | | | | | | | |
| *Nais* sp. (*=present) | — | — | * | * | * | — | — | * | * | * |
| MOLLUSCA | | | | | | | | | | |
| GASTROPODA | | | | | | | | | | |
| *Planorbis corneus* | — | — | — | 52 | — | 12 | 15 | 13 | 12 | 52 |
| *P. planorbis* | 1 | — | — | 42 | — | 12 | 9 | 5 | 17 | 43 |
| *P. vortex* | — | 4 | — | 89 | — | 54 | 14 | 2 | 23 | 93 |
| *P. leucostoma* | — | 3 | — | 32 | — | 15 | 19 | — | 1 | 35 |
| *Lymnaea auricularia* | — | 2 | — | 1 | — | — | 3 | — | — | 3 |
| *L. peregra* | 26 | 942 | 868 | 251 | 93 | 867 | 397 | 308 | 608 | 2180 |
| *L. stagnalis* | — | — | — | 3 | — | — | 3 | — | — | 3 |
| *L. glabra* | — | — | — | 1 | — | 1 | — | — | — | 1 |
| *Valvata piscinalis* | — | — | — | 38 | — | 38 | — | — | — | 38 |
| *V. macrostoma* | — | — | — | 11 | — | 11 | — | — | — | 11 |
| *Bithynia leachii* | — | 1 | — | 284 | — | 84 | 136 | 26 | 39 | 285 |
| *B. tentaculata* | — | — | 1 | 1623 | — | — | 636 | 751 | 237 | 1624 |
| *Potamopyrgus jenkinsi* | 127 | 75 | 106 | — | 1747 | 206 | 92 | 1437 | 320 | 2055 |
| LAMELLIBRANCHIATA | | | | | | | | | | |
| *Sphaerium* sp. | 1 | — | — | 2 | — | — | 1 | — | 2 | 3 |
| *Pisidium* sp. | — | — | — | 22 | — | 15 | 4 | 1 | 2 | 22 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| ARTHROPODA | | | | | | | | | | |
| CRUSTACEA | | | | | | | | | | |
| *Gammarus pulex* | — | 16 | — | 47 | — | 18 | 32 | 13 | — | 63 |
| *G. lacustris* | 1 | — | — | — | — | — | — | 1 | — | 1 |
| *G. duebeni* | 120 | 96 | 79 | 18 | 7 | 145 | 48 | 46 | 81 | 320 |
| *Asellus aquaticus* | — | — | — | 53 | — | — | 8 | 1 | 44 | 53 |
| *Sphaeroma rugicauda* | — | — | — | — | 2 | — | — | 1 | 1 | 2 |
| *Neomysis integer* | 4 | — | — | — | 3 | — | — | 4 | 3 | 7 |
| *Palaemonetes varians* | 6 | 4 | 3 | 3 | — | 3 | 1 | 7 | 5 | 16 |
| *Crangon vulgaris* | — | — | — | — | 1 | — | — | — | 1 | 1 |
| INSECTA: TRICHOPTERA | | | | | | | | | | |
| Polycentropidae | — | — | 2 | — | — | 2 | — | — | — | 2 |
| *Rhyacophila* sp. | 1 | — | — | — | 1 | 1 | 1 | — | — | 2 |
| INSECTA: ODONATA | | | | | | | | | | |
| *Ischnura elegans* | 17 | 2 | 3 | 6 | 1 | 5 | 6 | 10 | 8 | 29 |
| INSECTA: COLEOPTERA | | | | | | | | | | |
| *Hygrobia hermanni* | — | 2 | — | 3 | — | — | 1 | 3 | 1 | 5 |
| *Hydrophilida* sp. | 2 | — | — | — | — | — | 2 | — | — | 2 |
| *Hydrobius fuscipes* | 2 | 11 | — | 6 | 2 | — | 6 | 8 | 7 | 21 |
| *Enochrus quadripunctatus* | — | 2 | — | — | — | — | — | 2 | — | 2 |
| *Haliplus lineatocollis* | 4 | 6 | 11 | 1 | 2 | — | — | 8 | 16 | 24 |
| *Hygrotus inaequalis* | — | 1 | 5 | — | — | — | — | — | 6 | 6 |
| *H. quinquilineatus* | 2 | — | — | — | — | — | — | 1 | 1 | 2 |
| *Dytiscus marginalis* | — | 2 | — | 1 | — | 2 | — | — | 1 | 3 |
| *Coelambus impressopunctatus* | — | 1 | 2 | — | — | — | — | — | 3 | 3 |
| *Colymbetes fuscus* | — | — | — | 2 | — | — | — | — | 2 | 2 |
| *Hydroporus nigrita* | — | 2 | — | — | — | — | — | 1 | 1 | 2 |
| *Hyphidrus ovatus* | — | — | — | 2 | — | — | — | — | 2 | 2 |
| *Laccophilus minutus* | — | 4 | 4 | 4 | — | — | 2 | 2 | 8 | 12 |
| *Noterus clavicornis* | 2 | — | — | 2 | — | — | — | — | 4 | 4 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| INSECTA: HEMIPTERA | | | | | | | | | | |
| *Notonecta glauca* | 10 | 7 | — | 2 | — | 13 | 3 | — | 3 | 19 |
| *N. viridis* | — | 2 | 5 | — | — | 3 | 2 | 1 | 1 | 7 |
| *Glaenocorixa propinqua* | — | — | 2 | 2 | — | 3 | — | 1 | — | 4 |
| *Corixa punctata* | — | — | — | 3 | 1 | — | 1 | 1 | 2 | 4 |
| *Corixa* sp. | 1 | 1 | — | — | — | — | 1 | 1 | — | 2 |
| *Hesperocorixa sahlbergi* | 1 | — | — | — | — | — | — | — | 1 | 1 |
| *H. linnei* | 1 | — | — | — | — | — | — | — | 1 | 1 |
| *Callicorixa praeusta* | 18 | 5 | 50 | — | — | 63 | 5 | 5 | — | 73 |
| *Sigara dorsalis* | 7 | 3 | 1 | 6 | 3 | — | 1 | 6 | 13 | 20 |
| *S. stagnalis* | 37 | 3 | — | — | — | — | — | 16 | 24 | 40 |
| *S. limitata* | — | 3 | — | — | — | — | — | — | 3 | 3 |
| *S. striata* | 12 | — | — | 1 | — | — | — | 2 | 11 | 13 |
| *S. scotti* | — | 2 | — | 1 | — | — | 1 | 1 | 1 | 3 |
| *Velia caprai* | — | — | — | 1 | — | — | — | 1 | — | 1 |
| *Nepa cinerea* | 1 | — | — | — | — | — | — | — | 1 | 1 |
| INSECTA: DIPTERA | | | | | | | | | | |
| Culicidae larvae | 2 | — | 6 | 10 | — | — | 2 | 9 | 7 | 18 |
| Tabanidae larvae | — | — | 1 | — | 9 | — | 3 | 2 | 5 | 10 |
| Tipulidae larvae | 1 | 2 | 2 | — | — | — | — | 4 | 1 | 5 |
| *Ptychoptera contaminata* | 1 | — | — | — | — | — | — | 1 | — | 1 |
| Ephydridae larvae | — | — | — | — | 1 | — | — | — | 1 | 1 |
| *Eristalis* larvae | — | — | 1 | — | — | — | — | 1 | — | 1 |
| *Odontomyia viridula* | — | — | — | 1 | — | — | 1 | — | — | 1 |
| *Chironomus* sp. | 314 | 222 | 161 | 203 | 8 | 115 | 124 | 369 | 300 | 908 |
| No. of invertebrate species | 29 | 28 | 21 | 41 | 17 | 25 | 35 | 43 | 48 | 67 |
| No. of invertebrate individuals | 737 | 1410 | 1313 | 2879 | 1881 | 1697 | 1611 | 3077 | 1835 | 8220 |
| VERTEBRATA | | | | | | | | | | |
| PISCES | | | | | | | | | | |
| *Anguilla anguilla* | — | — | — | 3 | — | — | 2 | 1 | — | 3 |
| *Gasterosteus aculeatus* | 11 | 13 | 4 | 11 | 4 | 21 | 7 | 9 | 6 | 43 |
| *Pungitius pungitius* | 6 | — | 1 | 15 | — | — | 7 | 8 | 7 | 22 |
| AMPHIBIA | | | | | | | | | | |
| *Triturus vulgaris* | — | — | — | 1 | — | — | — | — | 1 | 1 |
| No. of vertebrate species | 2 | 1 | 2 | 4 | 1 | 1 | 3 | 3 | 3 | 4 |
| No. of vertebrate individuals | 17 | 13 | 5 | 30 | 4 | 21 | 16 | 18 | 14 | 69 |

may reduce fecundity. *P. jenkinsi* is common high on the shore in the nearby Thames and in Dartford Creek (Knights and Cunningham 1983).

Bivalves were scarce and, other than one individual *Sphaerium* at Station 1, were found only at Station 4. Conditions were probably generally too silty for such filter feeders.

**(iii) Crustacea**

The isopod *Asellus aquaticus* is also intolerant of high siltation and eutrophication and was also found only at Station 4. Two *Sphaeroma rugicauda* were found at Station 5; they probably entered via the sluice from the Thames, as did the estuarine *Crangon crangon* and *Neomysis integer.*

One *Gammarus lacustris* was collected at Station 1. This species was found only in the River Wandle in the London area by TWA (Aston and Andrews 1978) but is present on Pitsea Marshes (Powlesland, unpublished results). *G. pulex* is much more common in the Cray and other London rivers but was found only at Stations 2 and 4 and was of secondary importance to *G. duebeni* throughout the year. The latter species shows a greater tolerance to salinity, temperature and hypoxia and is capable of crawling overland (Bulnheim 1979). It is common on the nearby Thames foreshore (Knights and Cunningham 1983), despite the fact that *G. zaddachi* is generally more representative of this region of the Estuary (Andrews *et al.* 1982). Gravid female *G. duebeni* were found in the Marsh ditches and migrants from this breeding population probably colonise the Estuary via the sluice. Gravid prawns *Palaemonetes varians* were also found at inland Stations in the summer. They are generally regarded as marine shrimps tolerant of brackish and freshwater and the Marsh population probably relied on annual recolonisation from the Thames. Lambert (1930) claimed that breeding populations existed in freshwater at Kearsey's Marsh, Benfleet, but Powlesland (unpublished results) did not find this or any other estuarine Crustacea, other than *G. duebeni,* at Pitsea Marsh where there is virtually no access from the Thames.

**(iv) Insecta: Trichoptera and Odonata**

Stoneflies and mayflies were absent and only a few caddis were found. Such larvae are intolerant of the ditch conditions but the nymphs of the dragonfly *Ischnura elegans* were fairly common, especially amongst the reeds at Station 1 in the summer. This species is common on Pitsea Marshes and in Ruxley Gravel Pits on the Cray (Bailey 1973).

**(v) Insecta: Coleoptera**

This group showed a high diversity (14 species) but a relatively low abundance (90 individuals, only three species being represented by more than 12 individuals). They were most numerous in the summer but rare at Station 5. The Coleoptera are well adapted to eutrophic fairly stagnant water and can fly from one body of water to another to avoid extreme conditions.

**(vi) Insecta: Hemiptera**

These were similar to the Coleoptera in showing a higher diversity (15 species) but a low abundance (192 individuals in total, less than 13 representatives in each of 10 of the species). Nymphs predominated over adults in the summer and autumn. They are mobile suctorial carnivores and detritivores and the corixids feed on filamentous algae; all are well adapted to moderately stagnant water. The still open water at Station 1 and the slow-flowing water near the banks at Station 3 were the preferred habitats. *Callicorixa praeusta* and *Sigara stagnalis* were the most abundant species, the latter being especially tolerant of eutrophic conditions. They are common at Pitsea Marshes but Powlesland (unpublished results) has found a much greater diversity not only of Hemiptera (20 species) but also of Coleoptera (28 species). This may reflect a preference for the lower salinity there (always below 1‰) or simply the more intensive and extensive collections made.

**(vii) Insecta: Diptera**

Larvae of eight species of Diptera were identified. They are well adapted to stagnant water and showed a widespread distribution through the Marshes, generally being most numerous in summer and autumn. Chironomids were the most abundant larvae throughout the year and especially in June. Only Station 5, the most variable and physiologically stressful one, showed a marked paucity. The chironomids probably displaced tubificids, as discussed earlier.

*Aquatic vertebrate diversity and abundance*

Fish were represented by large numbers of sticklebacks (three and ten-spined) and a few eels, species well adapted to fresh and saline stagnant waters. Other species may be present, especially in deeper more inland dykes, and some estuarine species may enter occasionally through the sluices (e.g. some common gobies *Pomatoschistus microps* were found entering Dartford Marshes by this route in the preliminary survey in summer 1979). One smooth newt *Triturus vulgaris* was netted and more intensive studies would probably reveal other Amphibia in the less stagnant ditches.

## Discussion

The Marshes have been shown to be subject to wide and potentially stressful variations in environmental conditions. Large inputs of plant debris into such shallow and still waters lead to high organic enrichment and eutrophication, but, on the other hand, this offers a rich source of energy and nutrients to suitably tolerant and adapted species. Such environments are typified by the high densities of the relatively few resistant species found in the study at all but Station 4. The statistical Coefficient of Association (T) was significantly different between this Station and Stations 1, 2, 3 and 5 (Powlesland, unpublished results). Fourteen of the 67 species identified were found only here and a further fourteen were present only in small numbers (four or less) at one of the other Stations. A high overall abundance was shown also at Station 4, due largely to the preponderance of leeches and molluscs. This Station is different from the others in being the most lotic and stable and because the greater diversity of current, substrate and macrophytes offered a greater range of ecological niches. In contrast, *Lymnaea peregra* was the dominant species associated with the limited macrophyte diversity at Stations 2 and 3, whilst *Potamopyrgus jenkinsi* was dominant on the barer muds at Stations 1 and, especially, 5. Chironomid larvae were also abundant on silty bottoms although conditions at Station 5 were probably too stressful, especially with regards to salinity variations. *Gammarus duebeni* showed a similar distribution at a lower abundance. It must be noted, however, that diversity at all Stations increased in the summer and autumn, mainly because of the occurrence in low numbers of tolerant insect species with nymphs and/or flying adults, i.e. 14 species of Coleoptera, 15 of Hemiptera and 7 of Diptera (excluding chironomids).

The overall diversity of macroinvertebrates on the Marshes (67 species) is lower than that found in T.W.A. surveys of London's rivers (211 species, Aston and Andrews 1978) but the latter studies were more extensive and included many riverine species of Platyhelminthes, Oligochaeta, Plecoptera, Ephemeroptera, Trichoptera and Diptera. The more lentic Five Arches Lake and Ruxley Gravel Pits on the R. Cray tend to show a greater diversity than the Marsh ditches, but these are much larger bodies of water with some through-flow and are thus less vulnerable to climatic fluctuations and gross eutrophications, and support a greater range of ecological niches (Bailey 1973, 1977; Heal and Bailey 1974; Knights *et al.* 1980). The Marshes were, however, more suitable habitats to support a wider range of diving Coleoptera and Hemiptera and, of course, brackish water species like *Gammarus duebeni* and *Palaemonetes varians*.

Few comparable studies of ditches were found in the literature. One of these was that carried out by Hingley (1979) on drainage channels on Pevensey Levels, E. Sussex, with particular reference to the effects of maintenance dredging on gastropods. They were found to recolonise channels rapidly after dredging, the most ubiquitous and abundant species (and always amongst the first colonizers) being *Bithynia tentaculata. B. leachii, Planorbis planorbis* and, especially, *Lymnaea peregra.* These were associated with a diverse submerged and emergent flora, whereas *Potamopyrgus jenkinsi* was limited to a few barer channels nearer the sea where it was very abundant. These results are in accord with those of the present authors and also with those of Jenkins (1891) in his study of the more extensive Thames Estuary marshes present in the nineteenth century.

Hingley (1979) made only brief reference to other invertebrates but did find some platyhelminthes and more *Asellus (A. meridianus* being more abundant than *A. aquaticus),* some arachnids, two species each of Ephemeroptera and Trichoptera and *Gammarus pulex* and *G. zaddachi* but not *G. duebeni.* She did, however, note that more taxa were found in open ditches with varied flora than those with a dense cover of *Lemna minor* because of the greater number of ecological niches available.

Caspers and Heckman (1981) studied ditches on Altes Land orchards, bordering the Elbe near Hamburg in Germany from 1978 to 1980; these were representative of seral stages similar to some of those in the present study but also included water bodies large and stable enough to support fish such as carp and tench. They found a greater macroinvertebrate diversity (over 138 species) as might be expected from such a long survey which also encompassed a greater diversity of habitats. Turbellaria, trematodes and spiders were notable additional taxa, but brackish-water species were absent and the abundance of *Lymnaea peregra* and diversity of diving Coleoptera and Hemiptera was lower. Caspers and Heckman (1981) made comparisons with studies of the same ditches carried out in 1958 and noted a decrease in diversity (especially with regards to water-mites (Hydracarina), Trichoptera and Coleoptera) and lower numbers of Bivalvia and the Hemiptera *Callicorixa praeusta* and *Sigara stagnalis.* They put this down to the effects of increased usage of pesticides (especially acaricides) in the orchards over the last 20 years or so, claiming the pesticides have had differential non-target effects on arthropod predators, allowing an increase in former prey such as Diptera. Whilst this may be partly true, the number of shallow stagnant areas has possibly been reduced by replacement of some ditches by underground drains, whilst others are dredged to keep the water open to help ameliorate the climate in the orchards. The relative increase in more open, stable and floristically diverse water bodies would encourage the faunistic changes observed, an hypothesis supported by the results of the present study and that of Hingley (1979). For example, Station 4 on Dartford Marshes supported a fauna most similar to that found generally by Caspers and Heckman and this was the most stable and diverse but least eutrophic site. The absence of aquatic mites in both studies is more difficult to explain in this way. This could be due to general climatic or biotic changes in Europe in recent years because they are also absent or sparse in Five Arches Lake (Knights *et al.* 1980) and on Pevensey Levels (Hingley 1979) and on Pitsea Marshes (Powlesland, unpublished results), although they were common in the early 1970s in London's rivers (Aston and Andrews 1978) and Ruxley Gravel Pits (Bailey 1973). No significant pollution of these various waters by pesticides is known to have occurred.

Lambert (1930) studied Thames-side ditches downstream of Benfleet on the northern shore of the Estuary, but direct comparisons with the present study are complicated because some of Lambert's ditches were exposed to much higher salinities and supported a typical estuarine fauna. Data from more freshwater ditches are sparse but agree well with that of the present study. Some unspecified mayfly larvae were found, however. The study of the ditches on Pitsea Marshes, Essex, by Powlesland (unpublished results) is more directly comparable and

revealed a similar but more diverse fauna at salinities between 0.28 and 1.00‰. Some notable differences were that *Asellus aquaticus* and *A. meridianus* were more common. Additional mollusc species included *Lymnaea truncatula, Planorbis albus, P. planorbis* and *Hydrobia ulvae.* The abundance of the last species generally exceeded that of *Potamopyrgus jenkinsi. H. ulvae* cannot reproduce at salinities below 8‰ and the ditch population was probably dependent on occasional entries through the sluices from breeding populations in the nearby saline creek. The mayfly *Cloeon dipterum,* two species of limnephilid Trichoptera, two extra species of Odonata and one moth species were also found. The diversity of Coleoptera and Hemiptera was also greater, as discussed previously. Environmental conditions, other than salinity ranges, were similar on both Marshes and whilst salinity may play a role, the biotic differences were probably due largely to the more extensive and intensive survey methods used at Pitsea and the greater diversity in types of site and the more diverse flora at some of these sites.

Clare and Edwards (1983) studied the land drainage channels on the Gwent Levels, South Wales, and also found a much more diverse fauna with 378 taxa. This can be explained by the greater extent of their survey and wider variety of sites studied. Similar species were, however, found to be dominant as compared to Crayford Marshes. Various classification and ordination techniques were used to identify species habitat preferences and results corresponded to those obtained in the present study, i.e. the distribution of species between sites appeared to relate to vegetational stage in the hydrosere (which was in turn influenced by management procedures), water flow, extent of saline incursion and oxygen status. *Lemna* cover was particularly important in affecting the oxygen status, as was the case at Site 2 on Crayford Marshes. The occurrence of particular species within a habitat was determined by their adaptations to low oxygen concentration and their food preferences and dispersal mechanisms.

## Conclusions

The marsh ditches support a biota well adapted to the environmental stresses inherent in such lentic and eutrophic ecosystems with varying degrees of saline intrusion from the Thames Estuary. Weed clearance to maintain drainage occurs, especially on the main ditches, e.g. at Stations 3 and 4. However, this is of lesser importance than the effects of natural climatically induced changes; recolonisation must occur very rapidly — as found by Hingley (1979) on Pevensey Levels — and since only some ditches are cleared each year, a moderately complex and changing variety of habitats is still left.

The present study dealt only in detail with more accessible ditches towards the eastward end of Crayford Marshes, but the preliminary survey showed that the more westerly ones were generally similar to those at Stations 2 and 3, although they were often deeper. If the Marshes were developed in the future, the drainage system would have to be maintained and providing all the ditches were not covered over and were managed sympathetically, great ecological changes would not have to occur. Chances of pollution could, however, increase. At present, pollution appears minimal except for some oil and urban debris. The present flora and fauna are already adapted to stressful environments and are generally recognised as being pollution tolerant. However, in any possible future development, the slow flushing and self-cleansing rates of the ditches would have to be borne in mind and measures taken to protect them from excessive pollution, especially run-off. Clean lotic ditches (e.g. as at Station 4) would be most vulnerable but this type is in any case not common on Crayford Marshes, the main focus of development plans.

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# Book Review

*Flora of the London Area.* By Rodney M. Burton, with drawings by Graham Easy. London Natural History Society, London. 1983. 225 pp. £16.50. ISBN 0 901009 02 4.

In 1914, following its foundation by the amalgamation of two previously existing societies, the London Natural History Society decided that its area of study would be a circle of twenty miles radius from St Paul's Cathedral. For flowering plants, a preliminary list of records was published between 1929 and 1936 by E. B. Bishop, R. B. Robbins and H. Spooner, and then between 1951 and 1957 the definitive *A Hand list of plants of the London Area* by D. H. Kent and J. E. Lousley appeared. Previously there had been a number of botanical works with 'London' in the title from Curtis's *Flora Londinensis* (1746-1799) onwards that were concerned with even larger and usually less precisely defined areas, but none of these was a local floristic work in the modern sense. So Rodney Burton's book is the first ever *Flora of London.*

It is based on records collected by members of the Society in the course of its mapping schemes from 1966 to 1976, but the author remarks with justice that 'it still is a fair

description of the state of London's flora today'. Thus it supersedes the *Hand list*, and brings the records included therein up to date.

Unfortunately it lacks anything resembling the useful sketch-map that was included in the *Hand list*, and also all references to vice-counties, which is a great pity from the point of view of continuity. Recording is exclusively with reference to the 2km squares of the National Grid, and the area covered is no longer a circle of twenty miles radius but a 68-sided polygon approximating to it that will already be familiar to members of the Society from the papers of H. A. Sandford in *The London Naturalist* **51:** 20-21 (1972), **52:** 155(1973), **54:** 72-73 (1973), **56:** 105-106 (1977) and **58:** 89-92 (1979). In the preliminaries of the *Flora* the maps from these references are reproduced showing rainfall, habitats, 'regolith' (a word meaning sub-soil that we owe, apparently, to that well-known coiner of unhandy technical terms, Alice Coleman) and air pollution (of very limited value, since it refers only to sulphur dioxide levels for the winter of 1976-1977).

Also in the preliminaries is a detailed, almost blow-by-blow, account of the progress of vicissitudes of the Society's mapping scheme of little interest except to the protagonists, and, more worth-while, ten pages of the author's meditations on factors affecting the distribution of plants in the London Area.

Then we come to the flora proper. Immediately we realise its unique feature: it is written as a continuous narrative, beginning with a clubmoss, *Lycopodum inundatum*, and ending with a bamboo, *Sasa palmata* and a brief coda that can be regarded as Rodney Burton's *apologia pro libro suo* and is signed by him and dated 1982. There are entries for 2055 numbered species and in addition there are passing references to many more of lesser importance that have not been allocated a number. For most of the numbered species a dot map of the distribution is given. But there is much more than this. In every paragraph there are remarks about the status of the records discussed, the history of the species as London or British plants, and useful and practical hints on recognising them. In some cases this information on identification is presented as a dichotomous key or a table of diagnostic features. This valuable aspect of the book is enhanced by Graham Easy's excellent drawings of significant parts of no less than 131 species. Thus we have a book in which the reader may browse either more or less at random or by reading it right through, and benefit from the author's very wide reading and extensive field experience.

Presumably with the amateur in mind, nomenclature follows the second edition of *Flora of the British Isles* by A. R. Clapham, T. G. Tutin and E. F. Warburg (1962). Since up-to-date names are used for the considerable number of aliens not mentioned in that work but included here, the names employed for some commoner plants look old-fashioned. It would have been better to have used as a basis the third edition of the *Excursion Flora of the British Isles* by the same authors (1981). The narrative approach has its defects too. Taxonomic categories above that of genus are only casually mentioned, if at all. Family names do appear in the running heads to the pages, but this is of little use as they are only loosely related to the text; frequently more than one family appears on a page, and the smaller families often receive no mention at all. These family names, authorities for species names and some synonyms are given in the index, but their omission from the general text is to be regretted.

The author says in his introduction that 'there are probably many incorrect records' that have been included, and proceeds to lists the various causes of this that could hardly have been eliminated entirely. His cautionary remark is certainly true, and it is probable also that errors of omission exceed in number errors of commission. Many field botanists with strong interests in particular localities will lose no time in pointing out these mistakes; of course, it is one of the functions of a local flora to arouse such criticism and stimulate further field work.

The more one reads the *Flora*, the more one comes to consider the question of the area that it covers. In no sense could this be regards as 'London', and it seems reasonable to suggest that any future mapping schemes undertaken by the London Natural History Society might well deal with a smaller area and involve more intense study of it. Indeed, the author in two recent papers (The Function of a Local Natural History Society', *The London Naturalist* **62:** 5-10, 1983 and 'What can replace the outmoded vice-counties?, *Botanical Society of the British Isles News* **35:** 25-26, 1983) suggests that the administrative area of Greater London might be used, but it seems likely that its boundaries will prove too ephemeral for the purpose.

Meanwhile, in spite of criticisms that can be made, this first *Flora of the London Area* is informative and readable and fulfils very well the purposes for which it was written.

FRANK BRIGHTMAN

# Some Observations on Ladybird Behaviour

by ELLA M. HILLMAN*

**1.** During the prolonged drought and hot summer of 1976 numbers of seven-spot ladybirds *Coccinella septempunctata* were exceedingly high. By mid-June many herbaceous plants had shrivelled and the lack of succulent sap must have caused widespread starvation amongst aphids. This in turn meant a shortage of food for ladybirds and numerous instances were recorded, even in the popular press, of their biting human beings. Was this a desperate attempt to find moisture or is it a common habit of ladybirds?

**2.** The question is raised as to whether the following example of apparently aggressive behaviour was induced by competition for food, or is it commonplace among ladybirds? Are they normally 'territorial,' like some butterflies, as is suggested by the fact that they are solitary in hibernation in a curled up leaf, usually only one insect per bush?

On 13 June 1976, on Bookham Common, I observed two seven-spot ladybirds each crawling up one of a pair of tall withered grass stems which were curving towards each other, so that when they neared the tops of the stems the insects were only two or three centimetres apart. Each stopped and stood motionless for a while, then the uppermost ladybird sat back on its hind parts and waved its front legs in a manner similar to that of a horse pawing the ground. This went on for perhaps half a minute, then the other insect began to copy this action. The effect was electrifying. They suddenly rushed at one another, gripped by the mouth parts, fell together and were lost to view in the dense herbage below. Because these ladybirds were of the same size, I assume them to be of the same sex (see observation 3), and by their actual size, if my memory is reliable, probably male.

**3.** On 11 May 1977, I came upon two seven-spot ladybirds mating in my garden at Grove Park, S.E.12. The male was noticeably smaller than the female, about three-quarters her size, and he was sitting comfortably on her back. When copulation took place, the hind part of the male vibrated from side to side, so rapidly that it appeared blurred like a whirling aircraft propellor, and this was kept up for several seconds, followed by a long resting period, still on her back. This procedure was repeated twice more in a period of about three minutes, after which I had to leave the scene. They had not parted, I do not know how long they had been together before I arrived, nor how long they continued so after I left.

**4.** By contrast, again in my garden, in early summer 1981, I observed the mating of two two-spot ladybirds *Adalia bipunctata*. I watched the male alight on the female, and they appeared to be of equal size. The act of copulation consisted of a few comparatively slow up-and-down movements, after which the male immediately flew off. There were no rapid lateral vibrations nor was there any resting period with repetition.

In placing these observations on record, it must be emphasized that 2, 3 and 4 are one-off sightings and it is not suggested that they are the norm for the species.

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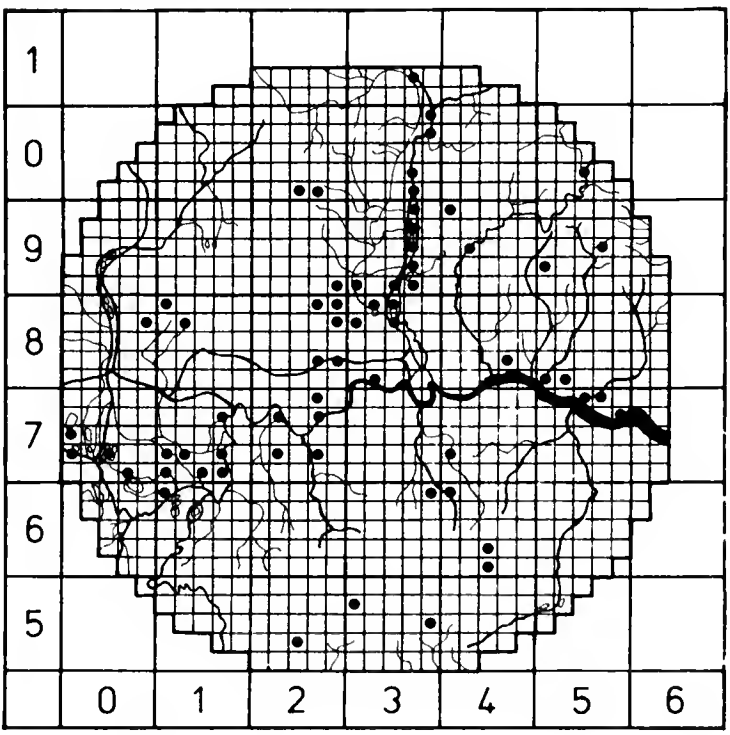
# The Clouded Yellow Butterfly *Colias croceus* Geoffroy in the London Area in 1983

by C. W. PLANT*

Few, if any, natural historians active in the field could have failed to notice that 1983 was a 'good' year for the clouded yellow. Indeed, it was probably the best year since 1941, when the butterfly was to be seen almost everywhere in Britain. During 1983, individual butterflies were recorded from every county in England and from a good deal of Scotland, whilst an adventurous male was even recorded north of the Arctic Circle in northern Lapland (A. R. Plant, pers. comm.). It is appropriate therefore to record in this Society's journal the extent of the invasion in the London Area.

The clouded yellow is a migrant to Britain, and a few reach our shores most years in the spring and may lay eggs to produce a scattering of butterflies in the autumn. In some years however, large numbers arrive in the spring and give rise to a proportionately larger numbers of offspring in the autumn. Notably good years have been 1877 ('the year of the *edusa*'), 1941 and now 1983. It seems that all the butterflies are killed off by our British winters since, as the species maintains a constant succession of broods throughout the year in its native areas, there is no hibernating stage. It therefore depends entirely upon migration to maintain its claim to a position on the British list. In the London area, sightings of at least 226 butterflies were reported, from the first on 8 June (a male in Battersea Park), to the last on 4 November (a male at Sewardstone, Essex, in the Lea Valley). The distribution of most of these sightings is shown in Figure 1, in which the small squares are tetrads (2 km × 2 km squares). Although many records have doubtless not yet been submitted to me as Recorder, and many more butterflies

FIG. 1. Distribution by tetrads of clouded yellow sightings in the London Area during 1983.

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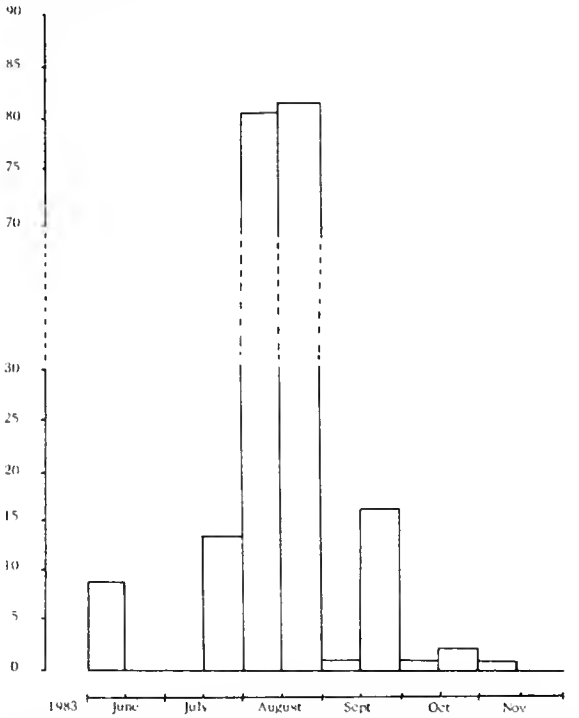
will have gone undetected by naturalists, the map shows clearly the significant relationship between river valleys and sightings. Of the sixty-four tetrad records plotted, forty-nine (76.5%), relate directly to the rivers system. What Figure 1 does not show however, is the number of butterflies recorded in each tetrad. If this were taken into account, the percentage of individual butterflies relating to the rivers system would be slightly higher. A further eighty records received could not be allocated to a specific tetrad, but of these forty-eight can definitely be related to areas on or near the River Thames, and a further three to other river areas, giving a total of 63.8% of the eighty individuals.

This is perhaps not really a surprising revelation, since the use of river valleys by migrating birds is well known; there is no reason to suppose that butterflies may not follow the same routes. The particularly heavy concentration of records in the Lea Valley, a very important bird migration route, seems to bear out this suggestion.

By grouping together the London Area sightings of clouded yellows into two-week periods and plotting these as a histogram (Figure 2), a clear pattern of events emerges.

FIG. 2. Numbers of clouded yellow sightings in the London Area in fortnightly periods, June to November 1983. There were no sightings outside this period. Twenty-three undated 'autumn' sightings have not been plotted here.




There was an influx of migrant butterflies in early June, followed by a period of about four weeks in which there were no immigrations. In the latter part of July, and throughout August, there were further massive immigrations of these butterflies (coinciding, incidentally, with parallel immigrations of other migrant Lepidoptera, such as the vestal moth *Rhodometra sacraria* L.), whose numbers were perhaps boosted by the progeny of the earlier arrivals. The third peak, in the second fortnight of September, represents further immigration on a lesser scale. This pattern of migration no doubt coincides with the continuous breeding cycle of the clouded yellow on the Continent.

The pale form of the female, f. *helice* Hb., which can be confused with the not dissimilar pale clouded yellow *Colias hyale* L., is genetically controlled by a sex-linked gene, and behaves as a dominant to the typical yellow form in a

balanced polymorphism with a ratio of about 10% in most populations. Only three f. *helice* were reported in the London Area however, two in the first half of August and one on the 22 September. It may be significant to note that of those reports given to me, which also noted the sexes of the butterflies recorded, about 70% of the observations related to males.

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# Book Review

*The Country Life Guide to Spiders of Britain and Northern Europe.* By Dick Jones. Country Life Books, Feltham, Middlesex. 1983. 320 pp. £7.95 (hardback), ISBN 0 600 35614 0; £5.95 (softback), ISBN 0 600 35655 5.

This history of the development of arachnology is a fascinating subject. It reveals for example that our knowledge of the spiders of Britain is due largely to the efforts of dedicated amateurs, from John Blackwall and Octavius Pickard-Cambridge in the 19th century, to Arthur Randell Jackson, G. H. Locket, A. F. Millidge, W. S. Bristowe and T. H. Savory in the 20th. It also shows quite clearly that until the early 1950s the absence of a standard text, which would enable reliable identifications to be made, restricted the study of this difficult group to a small band of enthusiasts who were able to correspond with each other and exchange specimens of new or difficult species. The turning point was the publication by the Ray Society, in 1951 and 1953, of *British Spiders*, written by G. H. Locket and A. F. Millidge. These two volumes provided the much needed reference material, brought together the knowledge of a century previously existing only in scattered papers and personal notes and enabled the serious worker to identify with confidence the material under his microscope. During the next two decades spiders attracted an increasing amount of attention, so much so that in 1969 the British Arachnological Society was formed and its membership has continued to grow in the ensuing years.

To complement the detailed technical descriptions available in *British Spiders*, and to cater for the growing band of people with a real interest in spiders as living creatures, but who have no wish to spend evenings at the microscope, there has been a real need for an illustrated book, a book of coloured pictures or photographs which could be carried into the field and used to identify the larger species in their natural habitats. Dick Jones has now provided such a book. Beginning in the mid 1970s by developing the necessary equipment and techniques, he has gone on to combine his skills as a professional photographer to produce a comprehensively illustrated field guide. He has done it well and it will fill that need.

The volume contains photographs of over 300 British and European species together with a much smaller number of pictures illustrating harvestmen and false-scorpions. These photographs are of a high standard. Although it must be said that one or two have printed rather darkly others are superb; just look at those reproduced on the dustcover. In most cases the spiders are in their natural habitats and show those features of shape and colour which will allow an identification to be made with reasonable confidence in the field. An introductory section gives a general description of the class Arachnida and is followed by sections describing the anatomy and life-history of spiders, descriptions of collecting methods and the techniques necessary to obtain successful photographs. A key to families is provided, illustrated with line drawings, and a concise description of each species is accompanied by the colour photograph together with details of the size range, habitat requirements and distribution. Of course, in the main, only those larger species which can be identified in the field have been included, but some of the more common members of the family Linyphiidae, which includes the very tiny money spiders, are illustrated. There is an index and a book-list for those stimulated to read further.

I welcome this book and it will be a boon to the growing band of spider-watchers.

D. R. NELLIST

# Hemiptera-Heteroptera of the London Area

## PART XIV

by ERIC W. GROVES*

(Previous parts of this paper have appeared in *The London Naturalist* as follows: Pt. I (**43:** 34-66, 1964); Pt. II (**44:** 82-110, 1965); Pt. III (**45:** 60-88, 1966); Pt. IV (**46:** 82-104, 1967); Pt. V (**47:** 50-80, 1968); Pt. VI (**48:** 86-120, 1969); Pt. VII (**50:** 87-94, 1972); Pt. VIII (**52:** 31-59, 1973); Pt. IX (**54:** 21-34, 1975); Pt. X (**55:** 6-15, 1976); Pt. XI (**56:** 32-43, 1977); Pt. XII (**61:** 72-87, 1982); Pt. XIII (**62:** 69-86, 1983). The bottom of each page in the above parts has been additionally numbered sequentially to facilitate indexing at the conclusion of this series on the *Hemiptera-Heteroptera of the London Area.* **However, the numbering to Pt. XIII was inadvertantly omitted, so readers are asked to add Nos. 270-287 inclusive to the bottoms of pages in their copy of** *The London Naturalist* **62.** A continuing list of abbreviations as to sources of records and for recorders' names has appeared whenever appropriate at the beginning of the parts listed above, and new additions to these are now given below.)

### SOURCES OF RECORDS

31. *Entomologists' mon. Mag.* 1→ 1833→ (abbreviated to EMM in the text for incidental references).
    (b) LESTON, D. 1957. *Sigara scotti* (Fieber) Hem: Corixidae in Surrey, EMM **93:** 216.
85. Personal records of J. H. Bratton (from Middx, Herts., Essex and Surrey).
86. Records from I. Lansbury collection† (from Middx., Herts., Essex, Kent and Surrey).

### INDEX TO RECORDERS' NAMES

J. H. Bratton *(JHB)*
J. D. Hillaby *(JDH)*
E. J. Pearce *(EJPe)*
E. Gowing-Scopes *(EG-S)*
T. Wilkinson *(TW)*

### CORIXIDAE *(Concluded)*

*Corixa dentipes* (Thom.) Sp. 486 p. 382

Uncommon. It has a life-history similar to that of *C. punctata* and the habitats in which it occurs are also much the same as in that species, i.e. ponds (often with the bottom covered with detritus), gravel pits and sometimes in slow streams. Lansbury states (source 31j) that like most corixids it has been found in such habitats often with widely differing pH values. Kent and Bucks. records required.

MIDDX. Hampstead Heath, 26.vii.50, in Viaduct Pond, *DL* (31a) (21) (86); South Mimms (Mimms Wash Stream), 3.iv.53, *IFL* (86); Ruislip Reservoir, 9.ix.33, (2♂♂), *DCT* (33a).

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†Lansbury's collection (from which London Area records have been extracted for this paper) consists of European and British Hydrocorisae, mostly his own material, but also some from other collectors. Up to November 1983 it had been housed in a separate cabinet in the Hope Dept, Oxford but after that date it was put into store boxes ready for dispatch to the Australian National Insect Collection, Division of Entomology, CSIRO, Canberra, A.C.T., Australia.

HERTS. Barnet, 7.v.54, *IFL* (86); Monken Hadley (Hadley Common), 22.xi.53 (3♂♂ 1♀) and 26.xi.53 (2♂♂ 8♀♀), *IFL* (31j) (BM) (86); Rye Meads, 28.x.61, a single ♀ in pond in the Meads, *BSN* (58); and beyond the boundary at Startop's End, 23.x.70, a single ♀ in the Grand Union Canal, *BSN* (58); and at North Church, 23.x.70, two specimens in the Grand Union Canal, *BSN* (58).

ESSEX. Epping Forest, 25.iii.07, *EAB* (C).

SURREY. Richmond Park, 27.viii.46, in open pond close to Ham Gate, *EJP* (68b); Epsom Common, 29.iv.66, frequent in small lake, in about 2ft of water amongst the base of stems of clump of milfoil/hornwort, *BSN* (58); on the boundary of Ranmore Common, 13.ix.72, in pond on the Common, *RRF* (66); Holmwood, 9.x.73, in Bond's Pond, *RRF* (66); Ockham Common, 27.ix.25 ♀, *JEHR* (BM); and beyond in the Basingstoke Canal between Pirbright Bridge and Frimley Green, 1954-55, *HDS* (20).

BUCKS. Beyond the boundary at Cholesbury, 4 miles W. of Chesham, 20.ix.81, *WJLeQ* (21).

*Corixa affinis* Leach Sp. 487 p.382

D & S p.595 S p.333 (*C. atomaria* pars)

B P.576 (Sp. 434b)

Rare. Occurs in ponds and ditches (particularly those that are brackish) along the Thames estuary though it has been found in a few isolated inland localities in silted or stagnant ponds (usually acid). Nothing is known of its life-history.

ESSEX. West Ham, *GCC* (BM); Epping Forest (Loughton), 3.vi.32 ♂, *FJC* (SL).

KENT. Lee, *ES* (36); Catford, *WW* (4) (39); Dartford Marshes, 26.vii.53, in dyke, *IFL* (86); Westerham, n.d., *PH* (22); and on the boundary at Gravesend, iv., in brackish water in ditch, *D & S* (28) (4) (36); *JAP* (BM); *GCC* (BM); 25.v.13, *ECB* (NM); and beyond at Higham, 28.ix.46, in dyke, not common, *AMM* (BM) (22).

SURREY. Bookham Common, 4.iv.31 ♂, *FJC* (SL); and Oxshott Heath, 7.v.04, *AJC* (HD).

*Corixa panzeri* (Fieb.) Sp. 488 p.383

D & S p.594 S p.333 (*C. atomaria* pars)

B p.575 (Sp. 434a)

Rare. Occurs in ponds, dykes, and small lakes with few weeds, a low amount of organic matter and a minimum depth of about 40 cm (2 ft) of water. Overwintered adults pair in early spring with egg-laying common in April. The larval instars take 2-2½ months before maturity is reached. As larvae have been found in bottom mud during winter there is possibly a second generation, but more observations on the life-history of this species are required in order to confirm this.

MIDDX. Hillingdon, 2.iv.33, a few examples from Swakeley's Pond, *DCT* (33a).

HERTS. Barnet, 4.iv.74, *IFL* (86); Cheshunt (Hooke's Marsh), 18.viii.71, fairly common in S. Gravel Pit, in stranded weed and in adjacent deep water, *BSN* (58); Rye Meads (SL 16), 30.ix.61, a single ♂ from marginal vegetation of effluent lagoon, *BSN* (58); (SL E. Channel), 22.viii.70, a ♀ amongst watercress in effluent stream, *BSN* (58); (Gravel Pit), 17.x.70, three examples taken in the gravel pit lagoon, *BSN* (58); (Gravel Pit, W. Pool), 8.iv.72, a single specimen in rich gravel pit pool, *BSN* (58); Haileybury (Roundings Pond), 11.xii.39 ♂ & ♀, *ESB* (HD); pond in the Master's Garden, 11.iv.40, *ESB* (HD); Brickenden Liberty, 14.iv.62, a single ♀ in rich pond, *BSN* (58); and beyond the boundary at Lemsford Springs, 5.ix.71, in watercress beds, one specimen in about 1cm. of water and silt, and another example which flew onto the hand, *BSN* (58).

ESSEX. Nazeing, 7.iv.13, *CN* (35a).

KENT. Dartford (Stone Marshes), 22.ii.28, *n.c.* (BM); on the boundary at Gravesend, iv., in brackish water in ditches, *D & S* (28) (36); *JAP* (BM); and beyond at Higham marshes, 27.ix.46, in dykes. *AMM* (BM).

SURREY. Richmond Park, 11.iii.57, in Martin's Pond, a single ♀, *DL* (31i); Wimbledon Common, 24.vii.46, in large closed pond near the Putney-Wimbledon road, situated ½ mile from the Wimbledon end of the Common, *EJP* (68b); 21.x.52, *DJC & JABo* (86); Epsom Common, 6.iv.66 ♀ from flood grass in temporary pond 1-2 ft deep, *BSN* (58); Bookham Common, 4.iv.31, *FJC* (SL) (62); 11.iv.54, a single specimen in Lower Eastern Pond, *IFL* (2/**38**:37, 1959); Esher Common, *ES* (36).

BUCKS. Beyond the boundary at Sheepcote, near Aylesbury, 12.iv.40 ♂ in pond, *ESB* (HD).

*Hesperocorixa sahlbergi* (Fieb.) Sp. 489 p.383
D & S p.600 (*Corixa sahlbergi*) S p.335 (*C. sahlbergi*)
B p.581 (Sp. 438, *C. sahlbergi*)

Common and occasionally dominant. This species is found in pools, ditches and disused cattle ponds. It may also occur in canals, particularly in those where, shaded by trees, the areas below become polluted by much organic material (e.g. rotting leaves and twigs). More usually found alone, but may sometimes occur in company with *H. linnei*. The overwintering female oviposits at the end of April and the young larvae take about 2-2½ months to reach maturity. *H. sahlbergi* feeds on vegetable detritus and is also a species that migrates freely. Bucks. records required.

MIDDX. Buckingham Palace grounds, viii.61, taken at MV light, *TRES* (52); Hampstead Heath, ix-xi.48, pond on the Heath, *JDH* (31a); Enfield (Beech Hill park take), 28.i.53 (12♂♂ 9♀♀) (71) (BM) (86), 15.ii.53 (3♂♂ 3♀♀) (71) (BM), 25.vii.53 ♂, (71), 25.ix.53 (3♀♀ 3♂♂), (71) (BM), and 6.xii.53 ♂ (71) — all records of *IFL;* (Wrotham Park, in large cattle pond), 8.iii.53 ♂ (71) (86), 22.xi.53 ♂ (71) and 13.xii.53 ♀ (71) — all records of *IFL;* South Mimms (Dyrham Park), in large pond, 18.i.53 (5♂♂ 12♀♀) (71) (86) (BM), 22.iii.53 (4♂♂ 1♀) (71) (86) (BM), 19.iv.53 (4♂♂ 3♀♀) (71), 17.v.53 ♀ (71), 20.ix.53 (2♂♂ 1♀) (71), 11.x.53 (9♂♂ 14♀♀) (71), 29.xi.53 (54♂♂ 43♀♀) (71) — all records of *IFL;* (Dyrham Park brook), 30.x.70, two examples from stream, *BSN* (58); (Mimms Wash Stream), 29.iii.53 ♀, (71) (86); 8.v.53 ♂ (71), 19.v.53 ♀ (71), 20.ix.53 (3♂♂ 2♀♀) (71), 29.xi.53 ♀ (71), 20.xii.53 (2♂♂ 1♀ 1♀) (71), 10.i.54 (3♂♂ 2♀♀) (71) — all records of *IFL;* (pond near the Mimms Wash), 3.iv.53, *IFL* (86); Hendon, 7.vii. 1896, in pond, *EAN* (C); Stanmore ponds, 14.x.70, in acid ponds, a single specimen, *BSN* (58); Greenford, v.02, three ponds in a meadow, *EAN* (C); Ruislip LNR, 1963-64, only occasionally in the Front Pool, *WFS,* and a single specimen found in the New Pool in Sept. (30.ix.64 ♀, *WFS*) (49); and Hanwell, 7.iv.06, *AJC* (HD).

HERTS. Whetstone, 20.vi.60 (3♂♂) taken in MV light trap, *PHW* (*pers. comm.* & 47); 29.vi.61, in MV light trap. *PHW*(BM); Barnet, 11.xi.51, *IFL* (BM); (Hadley Green), 9.iii.53, pond A, *IFL* (BM); 19.xii.71, in SW pond, frequent, *BSN* (58); 15.v.49, 29.iii.50 & 28.vii.51, *IFL* (86); Totteridge (Darland's Lake), 30.iv.83, *JB* (85); about 1 mile SW of Rickmansworth, 16.i.77, in a small pool fouled by sheep, *PAN* (78); Chorley Wood Common, 10.ix.71, in overgrown ponds, common, *BSN* (58); near Bricket Wood Common (Ambassador College grounds), 1.x.71, a single example in galvanised trough, *BSN* (58); Radlett, 25.ii.59 (2♂♂ 3♀♀), in gravel pit, *IFL* (86) (33h); (Old Parkbury), 10.xii.64, in small pools of gravel workings, frequent, *BSN* (58); Colney Heath, 28.viii.71, three examples taken in headstream of the River Colne, *BSN* (58); Smallford, west of Colney Heath, 17.xii.71, in gravel pit, frequent, *BSN* (58); Tyttenhanger gravel pit, 19.xii.71, frequent in pool, *BSN* (58); London Colney, 5.x.64, in River Colne at Smallford, adults frequent together with a single immature adult, *BSN* (58); St Albans (Oaklands), 17.xii.71, in gravel pool, frequent, *BSN* (58); between Brookman's Park and Water End, 24.xii.71, in field pond, frequent, *BSN* (58); North Mymms (Water End), 5.x.64, in Mimmshall Brook, abundant draught pools, *BSN* (58); near Hatfield, 4.v.52, in Park Gate gravel pits, *IFL* (BM); near Hatfield, 29.iii.59 (2♂♂ 3♀♀) in Pond A, 27.iii.59 ♂ in Pond B), 5.iv.59 ♂ in Pond C) and 22.ii.59 ♀ in Pond E, all records of *IFL* (33h); Essendon Road (Brookman's Park), 15.v.71, in shaded pond, a single specimen, *BSN* (58); Brookman's Park (Gobion's Pond), 5.x.64, in small lake, frequent, *BSN* (58); Cheshunt, 17.viii.60, ♀ in slow-flowing canal, *AAA* (51); Rye Meads, 11.x.64, in peat pool in gravel pit, frequent, *BSN* (58); Rye Meads, 11.x.64, in old pond and ditch, fairly common, *BSN* (58); (Toll Stream), 24.vii.71, in dyke in shade behind hut, frequent, *BSN* (58); (Meads) 28.x.61, 5♀♀ & 2♂♂ in deep pool, *BSN* (58); (NL/Meads), 30.vi.63, ♂,♀ & larvae, in ditch, *BSN* (58); (NL 1), 10.viii.60, a single adult in effluent lagoon, *BSN* (58); (small SL) 2.xi.68, a single adult in effluent lagoon, *BSN* (58); (south of railway), 8.xi.64, frequent both in effluent stream and in the River Stort, *BSN* (58); (N. Meads Pool) 25.vii.70, (2 adults) & 18.iii.72 (3 adults) in deep pool, *BSN* (58); Lemsford Springs, 23.v.71, in disused watercress beds, a single adult at N. end of N. lagoon, *BSN* (58); Broxbourne Woods, 6.iv.40, (4♂♂ 9♀♀) in large pond about 50×30 yards, fairly deep, *ESB*(67a) (HD). 13.vii.40 (6♂♂ 1♀) in smaller pond on same date, *ESB* (HD); Northaw (Hook Wood),28.v.52, *IFL* (BM); Wormley (Beaumont Manor), 5.x.64, in pond (frequent) and in a trough (common). *BSN* (58); Hoddesdon (Lodge Hollow), 11.vi.61, in gravel workings, a single specimen, and 29.x.61 ♀ in temporary pool, *BSN* (58); (Broad Riding Wood), 28.x.61 (7♂♂ 10♀♀) in open pond. *BSN* (58); Haileybury College, 11.iv.40 ♂, in pond in the Master's garden. *ESB* (HD); 19.ii.39, 11.xii.39, 9.iv.40, 30.vi.40 ♂, & 14 vii.40 ♀, all in Rounding's Pond, Hertford

Heath, *ESB* (HD); 12.xii.71, in Rounding's Pond, overgrown, frequent, *BSN* (58); 9.vii.40 (2♂♂ 1♀) in pond in Bell Wood, *ESB* (HD); 20.ix.39, pond by Roman Road, *ESB* (HD); 3.iv.40, pond (HT3) on Hertford Heath, *ESB* (HD) (67a); 5.x.40 ♂ & 7.x.40 2♀♀, *ESB* (67a); artificial pond in Golding's Wood (HT7) near Hertford Heath, 7.x.40 (2♂♂ 2♀♀), *ESB* (67a); 9.vii.40 (6♂♂ 1♀) in pond (HT4) near Hertford Heath, partly overhung by trees, *ESB* (67a); Hertingfordbury, 4.vii.40 ♂, pools in gravel pits near Cole Green, *ESB* (67a); Brickenden Liberty, 14.iv.62, 6♂♂ & 5♀♀ in one pond and more than 10 in another, *BSN* (58); (Pembridge Lane Farm) 12.xi.61, in pond, *J. Walling* per *BSN* (58); (Elbow Lane), 6.v.62, 2♂♂ & 3♂♂, in pond, *BSN* (58); (Ettridge Farm), 11.x.64, in trough, common, *BSN* (58); Jenningsbury, 3.viii.40, ♂ & 2 ♀♀, in Moat, in that part shaded by trees, *ESB* (67a) (HD); pond by the Hertford-Hoddesdon road near Jenningsbury, 10.iv.40 (2♂♂ 1♀) & 16.vi.40 ♀, *ESB* (67a) (HD); a stream near Hertford (HT9), 3.viii.40 ♂ & 2♀♀, *ESB* (67a); and on the boundary at Bengeo Hall, Hertford, 6.x.64, in both River Rib and River Lea, in slack water with *Sparganium*, *BSN* (58); and boundary at Wheathampstead, 13.v.59 (1 example), 22.v.59 (1 example); vii.-ix.59 (45 examples), 5.viii.60 ♂ and 13.ix.60♀ in MV light trap situated in small orchard of fruit trees, *IFL* (33h).

Essex. West Ham, *GCC* (BM); Chingford, ix.12, *EAB* (BM); Epping Forest, 25.iii.07, *EAB* (C); 10.vii.42, *PJLR* (20); 23.iii.52, *IFL*(BM) (86); (Fairmead Bottom), in bomb crater ponds — Pond A, 10.iv.52 ♂ (33f) (BM) (86), 13.iv.52 ♀ (33f) (BM), 19.iv.52 ♀ (33f), 28.ix.52 ♂ & ♀ (33f), 15.iii.53 (BM), — Pond B. 23.iii.52 ♀ (33f), 13.iv.52 ♀ (33f) (BM), 19.iv.52 ♀ (33f), 28.ix.52 ♂ & ♀ (33f) (BM), — Pond C. 23.iii.52, 2♂♂ & 3♀♀ (33f) (86); 10.iv.52♂ (33f), 13.iv.52, 2♂♂ (33f) (BM) (86), 15.iii.53 (BM), — Pond D. 13.iv.52 ♂ (33f) (BM), 28.ix.52, 3♀♀ (33f) (BM), — all the above records are of *IFL*; (High Beech pond), xi.16, *CN* (35a); 22.x.64, common, *BSN* (58); (Wake Valley pond), n.d. [prior to 1923], *CN* (near Wake Valley pond), 5.vii.40, in small pond on opposite side of New road, *ESB* (67a); (pond near the 'Robin Hood'), n.d. [prior to 1923], *CN* (35a); (Earl's Path pond), 15.iii.53, *IFL* (BM); Epping (Lindsey Street), 25.ix.64 ♂ 1♀, in rich deep pond, *BSN* (58); Epping Plain (Tilekiln ponds), 25.ix.64(4♂♂) in large pond, *BSN* (58); Epping Bury, 22.x.64 (2♂♂) in trough, *BSN* (58); Epping Bury Farm, 25.ix.64 (5♂♂ 1♀) in cattle trough, *BSN* (58); Epping Upland (Chambers Manor), 25.ix.64 ♂, in cattle pond, *BSN* (58); Epping Long Green, 25.ix.64, very abundant in a ditch and very common in an open pond, *BSN* (58); Rye Hill, N.W. of Epping Upland, 27.x.64, at Rivett's Farm, common in field pond and two examples taken in a cattle trough, *BSN* (58); Nazeing (Middle Street) 25.ix.64, in roadside pond, very common, *BSN* (58); Roydon Hamlet, W. of Nazeing, 16.xii.64, under ice in flooded greenhouse boiler-pit, but swimming actively, very common, *BSN* (58); Little Parndon (Parndon Hall), 19.x.62 ♂, *BSN* (58); 6.x.64, in dyke, fairly common, *BSN* (58); Great Parndon (Katherine's) 23.x.64, in Parndon Brook, common, *BSN* (58); near Roydon, 5.viii.40 ♂, *ESB* (HD); Romford, ii. & iii.17, *n.c.* [but probably *T. R. Eagles*] (SL); Stifford, near Grays, 11.viii.79, *LJ* (77); and just over the boundary at High Laver, 17.x.62 ♂, in roadside pond, *BSN* (58); and at Magdalen Laver, 22.x.62 (2♂♂ & 1♀ others present), in roadside pond, *BSN* (58).

Kent. Blackheath (garden at 63 Blackheath Park), 15.xi.58, 26.x.58, 29.x.58, 27.iv.59, 3.vii.59 and 16.vii.59, all in garden pond, mostly singly, *AAA* (51) (22); Shooter's Hill (Eaglesfield), 10.vi.81, a single ♀ in a shallow, shaded grassy pond, *AAA* (51); Lee, *JAP* (BM); *GCC* (BM); 23.iv.1898, pond near Grove Park, *WW* (SL) (4) (22); Eltham, *JS* (BM); Catford, WW (4); Dartford Marshes, 5.x.52, in dyke, *IFL* (BM); and on the boundary at Gravesend Marshes, 27.iv.16 (2♂♂), 17.iv.19 ♀ & 9.x.15 ♂, *ECB* (NM) (22); and Higham Marshes, 7.xi.37, 16.iv.46 & 28.ix.46, in dykes, abundant, *AMM* (BM).

Surrey. Richmond Park (Pen Ponds), 1934-38, *EJP* (68b); (small open pond 100 yards N.E. of Ham Gate), 21.iii.54 ♂, *DL* (31i); (Martin's Pond), 4.iii.57 ♂, *DL* (EMM **93:** 216, 1957); Wimbledon Common, 23.iii.54 ♀, in small pond 200 yards W. of Kingsmere on the S. side of the Portsmouth Road (the fauna was found to be very poor and only one bug found in 30 minutes; the pond is now shallow and merely a flooded *Sphagnum* hollow), *DL* (31i); Shirley Common, 1.iv.1899, pond in the wood, *WW* (62) (60); Banstead, 20.vii.52 (3♂♂ & 4♀♀), 21.vii.52 ♀ and 2.viii.52 (3♂♂ 5♀♀) at MV lamp, *AEG* (76) (1/**1952-53**, 12); 10.viii.53 ♂, at MV light, *AEG* (EMM **90:** 166); Reigate, *circa* 1950, in muddy pond in May, *GBR* (45); Leatherhead, 11.v.24, *WEC* (BM); Bookham Common, 28.iv.51, in IOW pond, *DL* (34); 11.iv.54, in IOW pond, *EWG* (24); Effingham, 18.v.31 ♂, *FJC* (SL) (1/**1931-32**, 56); Oxshott Common, 2.iv.04 ♀, *ECB* (NM); 20.ii.05, 26.ii.05 & 6.v.08, *AJC* (HD); Esher Common, *GCC* (BM); 7.v.04 & 19.vi.04, *AJC* (HD); 1922-25, in deep temporary pools colonised by *Juncus bulbosus* and in drainage ditch dug after tree felling, *OWR* (61); 23.iii.31 ♂ & ♀, 15.x.51 (2♂♂ & 2♀♀), 23.x.51 ♂ & ♀, and 29.x.51 ♀, *FJC* (SL); (Black Pond), 23.iii.31, *FJC* (1/**1931-32**, 49); 8.x.51♂, *FJC* (SL); Ockham Common, 27.ix.25, *JEHR* (BM); and beyond the boundary at Woking, *GCC* (BM); 23.v.31 (2♂♂ & 2♀♀),

*FJC* (SL) (62); Chobham, iv. 1876, *ES* (HD); 4.x.36 (4♀♀ 1♂), *ECB* (NM); Horsell Common, 26.iii.05, *ECB* (NM); and in the Basingstoke Canal between Pirbright Bridge and Frimley Green, 1954-55, *HDS* (50).

BUCKS. Beyond the boundary at Sheepcote near Aylesbury, 13.iv.40 ♂ & ♀, in pond, *ESB* (HD); and Cholesbury Village pond, 10.ix.71, in rich pond, frequent, *BSN* (58).

*Hesperocorixa linnei* (Fieb.) Sp. 490 p.384
(=*Anticorixa linnei* (Fieb.))
D & S p.601 *(Corixa linnei)* S p.335 *(C. linnei)*
B p.582 (Sp. 439, *C. linnei)*

Common. Occurs in similar situations to those of *H. sahlbergi,* but in addition it is found in habitats where marginal vegetation provides more rapid decomposition of organic material and thus the water contains a higher percentage of nutrients in solution. Overwintering adults pair in March to April, the females subsequently attaching their eggs to the submerged parts of stalks of water-weeds. Like the last this species has also been recorded at light in a MV trap.

MIDDX. Hampstead Heath, ix.-xi.48, in pond, *JDH* (31a); Greenford, 25.iv.03 ♂, *ECB* (NM); Crews Hill (Sanders Corner), 22.x.70, a single example taken in a nitrogenous stream with fairly rich vegetation, *BSN* (58); Trent Park (West Drive Pond), 10.viii.71, rich open pond, frequent, *BSN* (58): Enfield (Chase Stream), v.49, *IFL* (86); (Beech Hill Park lake), 28.i.53 ♀, 15.ii.53 (4♀♀ 1♂), 8.iii.53 ♂, 25.viii.53 (1♂ 2♀♀), 25.ix.53 ♀, 29.x.53 ♂, *IFL* (71); (Wrotham Park), 22.ii.52 ♀, 8.iii.53 ♀, 22.xi.53 (5♂♂ 4♀♀) & 13.xii.53 (2♂♂ 4♀♀), *IFL* (71); 22.v.71, large pasture pond, *BSN* (58); South Mimms (Mimms Wash Stream), 21.iii.54, *IFL* (86); (Dyrham Park, in overgrown ornamental pond), 18.i.53 (86♂♂ 92♀♀), 22.iii.53 (15♂♂ 7♀♀), 19.iv.53 (4♂♂ 5♀♀), 17.v.53 (5♂♂ 2♀♀), 20.ix.53 (6♂♂ 7♀♀), ii.x.53 (23♂♂ 27♀♀), 29.xi.53 (13♂♂ 9♀♀), and 13.xii.53 (3♂♂ 3♀♀), around margin of the pond in 18 inches of water where it was clear of vegetation, *IFL* (71); 18.i.53 & 22.iii.53, *IFL* (BM) (86); (Dyrham Park, in large pond with detritus covered bottom), 22.iii. 53 ♂, 19.iv.53 ♂, 20.ix.53 (3♂♂), 11.x.53 (2♂♂) and 29.xi.53 (5♂♂ 2♀♀), *IFL* (71); 19.iv.53, *IFL* (BM); (Dyrham Park brook), 30.x.70, two examples in stream, *BSN* (58); Stanmore (Spring Pond), 28.xi.51, *PNL* in *IFL* coll. (86); Stanmore Ponds, 14.x.70, fairly common in acid ponds, *BSN* (58); Ruislip LNR, 1963-64, frequently noted in the Front Pool, *WFS* (49); Hanwell, 15.x.05, *AJC* (HD); 16.ix.31, *FJC* (SL); 11.iv.19 ♂, in 1st & 2nd ponds, *n.c.* [perhaps *T. R. Eagles*] in *FJC* coll. (SL).

HERTS. Barnet (Hadley Green), 19.vii.49 & 8.v.50, *IFL* (86); (in large pond on the Green), 27.i.53 ♀, 22.ii.53 ♂, 9.iii.53 ♀, 26.iv.53 ♂, 25.viii.53 ♀ & 25.ix.53 ♂, *IFL* (71); (in small circular pond on the Green), 27.i.53 (1♂ 2♀♀), 22.ii.53 ♀, 6.v.53 (♂ ♀) & 22.xi.53 ♂, *IFL* (71); (S.W. Pond), 19.xii.71, frequent, *BSN* (58); (N.W. Pond), 19.ix.71, in leafy pond, common, *BSN* (58); (Round Pond), 21.iv.72, two examples from this marshy pond, *BSN* (58); Monken Hadley (Hadley Common), 26.iii.53 (1♂ 2♀♀), 25.ix.53 (2♂♂) & 2.xi. 53 ♀, in small circular pond with much detritus and clay bottom, pH 7-7.5, *IFL* (71) (31j); Totteridge, 19.ix.37, in pool by roadside, muddy, *GAW* (67b); Radlett Gravel Pit, 6.iii.59, (3♂♂ 2♀♀) *IFL* (86) (33h); Colney Heath, 28.viii.71, in river pool of the River Colne, a single specimen, *BSN* (58); London Colney, 14.x.70, in the River Colne, a single specimen, *BSN* (58); Tyttenhanger Gravel Pit, W. of Colney Heath, 19.xii.71, in rich gravel-pit pool, fairly common, *BSN* (58); Smallford Gravel Pit, 17.xii.71, mature gravel pit, common, *BSN* (58); St Albans (Oaklands), 17.xii.71, in gravel-pit pool, frequent, *BSN* (58); near Hatfield, 4.v.52, in Park Gate gravel pit, *IFL* (86); near Hatfield, 20.iii.59 ♂ & ♀, in Pond A, *IFL,* (33h); Essendon (Wild Hill), 1.v.71, in shallow field pond, frequent, *BSN* (58); Rye Meads (Gravel Pit, W. Pool), 25.iii.72, a single specimen in rich gravel pit pool, *BSN* (58); (SL 11), 2.iv.66 ♀, in effluent lagoon, *BSN*(58); (N. Meadow pond), 11.xii.71, in deep pool, common among *Carex* along S. edge, *BSN* (58); 18.iii.72, in deep pool, common, *BSN* (58); (pool between Old and New Gravel Pits) 27.xii.71, rich gravel-pit pool, frequent, *BSN* (58); Rye House, 18.ix.71, in the Lee Navigation about 200 m N. of railway, a single specimen, *BSN* (58); Potter's Bar (SE), 22.x.70, in pasture pond, a single specimen, *BSN* (58); Haileybury, 5.iv.40, 2♂♂ & 1♀ in artificial pond in Golding's Wood near Hertford Heath, *ESB* (HD) (67a); Bayford, 25.iv.62 ♀, in village pond, *BSN* (58); Brickenden Liberty, 14.iv.62 ♀, in pond. *BSN* (58); on the boundary at Waterford, 29.x.64, frequent in gravel workings, *L.Lloyd-Evans* per *BSN* (58); Pye Corner (Pole Hill Farm): 3.xi.64, in small stream, *BSN* (58); Hunsdon Hill, by River Stort, 15.viii.71, in canal overflow, frequent, *BSN* (58); and beyond at Harpenden (Rothamsted Expt. Station grounds) 15.viii.35, taken in light trap, *DCT* (12) (59); 6.viii.50 ♀, taken in MV light trap, *ESB* (84).

Essex. West Ham, *GCC* (BM); Chingford, 20.xii.12, *EAB* (BM); Epping Forest, 24.iv.16, *EAB* (BM); (Fairmead Bottom) in bomb crater ponds — Pond B. 23.iii.52 (7♂♂ 5♀♀), 13.iv.52 (3♂♂ 2♀♀), 19.iv.52 (♂ & ♀), 28.ix.52 (5♂♂ 6♀♀), Pond C. 24.iii.52 (♂ & ♀), 10.iv.52 (3♀♀), 13.iv.52 ♂, 28.ix.52 (4♂♂ 3♀♀), Pond D. 13.iv.52♀, 28.ix.52 (3♀♀) — all records of *IFL* (33f); (High Beach pond), ix.16, *CN* (35a); (Earls Path pond), 15.iii.53, *IFL* (86); (Golding's Hill ponds), 2.vii.40, ♂ & ♀ in lower of the two ponds, *ESB* (67a) (HD); (Loughton) 2.xi.12, *EAB* (BM), 11.iv.52, Staples Road, *IFL* (86); 22.x.64, in ponds, very common, *BSN* (58); (Wake Valley pond), n.d. [prior to 1923], *CN* (35a); 5.viii.40 ♂ & ♀, a large pond (200 yards × 100 yards) with shallow sides, *ESB* (67a) (HD); Little Parndon (Parndon Mill), 6.x.64, in dyke, frequent, *BSN* (58); 15.x.64, in the River Stort overflow, common, *BSN* (58); Potter Street (Harlow Common), 30.x.64, in clay pond, *BSN* (58); Stifford, near Grays, 11.viii.79, *LJ* (77).

Kent. Plumstead, *WW* (39); Lee, *JAP* (BM); *GCC* (BM); 24.iv 1897 ♂ & 30.x.1899 ♀, pond in field, Hither Green Lane, *WW* (SL) (39); Catford, *WW* (39); Ruxley Gravel Pits, 17.iii.63, *KCS* (14); Dartford Marshes, 5.x.52, in dykes, *IFL* (86); Westerham, 28.iv.23, *PH* (BM*); and on the boundary at Gravesend, *JAP* (BM); Gravesend Marshes, 9.x.15 ♀, *ECB* (NM) (22); Gravesend (Filboro' Marshes), 5.iv.47, in ditch, *TRES* (13); and beyond at Higham Marshes, 7.xi.37 & 23.iii.38, in dykes, and 28.ix.46 in dykes, common, *AMM* (BM).

Surrey. Richmond Park, 1934-38, in Pen Ponds, *EJP* (68b); Wimbledon Common, 24.viii.46, in Queensmere which has a bottom of concrete and mud, pH 6.5, *EJP* (68b); Banstead, 26.vii. 52 ♂ & 2.viii.52 ♂, at MV lamp, *AEG* (76) (1/**1952-53,** 12); Godstone, 21.ix.71, in small pond in a field north of the A25, *KCS* (14); Headley, 7.v.74, in Stable Pond in Nower Wood Nature Reserve, *RRF* (66); Epsom Common (Stew Pond), 24.v.70, a single example in smaller pond, *BSN* (58); Bookham Common, 8.vi.31 ♂, *FJC* (SL); 28.iv.51, in IOW pond, *DL* (34); 29.ix.51, *DL* (54) (34); 31.iii.60, *DGH* (57); Esher Common, 15.viii.70, a single specimen in a deep, trickling, ditch in plantation, *BSN* (58); and on the boundary at Byfleet, 24.iv.17, *EAB* (BM); (Basingstoke Canal), 4.v.47, in neighbouring streams, SL (1/**1947-48,** 60); and beyond at Woking, *GCC* (BM); 23.v.31 ♂ & 3.vi.31 (1♀ & 2♂♂), *FJC* (SL).

Bucks. Beyond the boundary at Sheepcote, near Aylesbury, 13.iv.40 (2♂♂), *ESB* (HD).

*Hesperocorixa castanea* (Thoms.) Sp. 491 p.385

Rare. In Britain this bug is predominantly a northern and western species found in acid upland pools and ponds. Confirmed records have been made in southern Britain (*fide* Southwood and Leston, *Land and Water Bugs of the British Isles,* p.385). In the London Area there have been known records from Surrey for some years, and more recently others have been noted in Middlesex and Essex (see below). Within our area it occurs in habitats similar to the two preceding species, particularly where the water has a high amount of organic material in solution. Lansbury, studying bomb-crater ponds in Epping Forest in 1952 (source 33f), says of *castanea* that it 'is found in habitats in their last evolutionary stage, that is, with strongly emergent vegetation'. *H. castanea* has a life-history much the same as that of *sahlbergi* and *linnei.* Further records from all areas are desirable, particularly from Bucks. as none from the L.N.H.S. part of that county is at present available.

Middx. South Mimms, 3.iv.52, pond near the Mimms Wash, *IFL* (86); Enfield (Wrotham Park) 19.iv.53 & 11.x.53, *IFL* (86); Greenford, 27.v.01 & v.02, in marsh and ponds, *EAN* (C).

Herts. Barnet, 7.v.74, *IFL* (86); (Hadley Green), 9.iii.53 & 6.v.53 (both Pond A), *IFL* (86); 19.iv.49, 19.vii.49, 8.v.50 & 5.ix.51 (open habitat, pH 4.5), all records of *IFL* (86); Radlett Gravel Pit, 25.ii.59, *IFL* (86); near Hatfield in Park Gate Gravel Pit, 4.v.52, *IFL* (86).

Essex. Epping Forest, 25.iii.07, *n.c.* [but probably *EAB*] in *ECB* coll. (NM); (Loughton), 3.iii.12, *EAB* (BM); (Fairmead Bottom), bomb crater ponds — Pond B, 28.ix.52 (3♂♂ 4♀♀), pH 7.5, *IFL* (33f) (86) — Pond C, 19.iv.52 (2♂♂ 3♀♀), pH 7.0, *IFL* (33f) (86) and 15.iii.53, *IFL* (86); (Earl's Path Pond), 15.iii.53, *IFL* (86); (Big Hill Pond), 3.i.03, *n.c.* in *ESB* coll. (HD); small pool (about 10 yards diameter) just outside the W. border of Epping Forest, 5.viii. 40 (♂ & ♀), *ESB* (HD).

*This specimen of P. Harwood's in the BM is certainly *H. linnei,* but is wrongly cited by Massee (source 22) under *H. moesta.*

KENT. Ightham, 15.vii.61, *KCS* (14) (22).

SURREY. Richmond Park, 21.iii.54 (2♂♂ 5♀♀), in small pond (SR19) 100 yards N.E. of Ham Gate, and 21.iii.54 (2♀♀) in open pond (SR20) quite close to Ham Gate, both records of *DL* (31i); 8.iv.55, near Ham Gate, *AMM* (BM); (White Ash Pond), 6.i.52, *DJC & JABo* in *IFL* coll. (86); Wimbledon Common, *JAP* (BM); (Queensmere) 23.iii.54 ♂, and (in a large closed pond (SR13) near the Putney-Wimbledon road, situated ½ mile from the Wimbledon end of Wimbledon Common) 23.iii.54 (52♂♂ 38♀♀) — both records of *DL* (31i); 9.xii.51, *DJC & JABo* in *IFL* coll. (86); 5.xii.53, in gravel pit, *DJC* in *IFL* coll. (86); 23.viii.46, small pond (SR6) 200 yards W. of Kingsmere on the S. side of the Portsmouth Rd., *EJP* (68b); 24.viii.46, small closed pond (SR7) in woodland 300 yards W. of Kingsmere on the S. side of the Portsmouth Rd., *EJP* (68b); Bookham Common, 11.iv.54, a single specimen in Lower Eastern Pond, *IFL* (2/**38**, 58, 1959) (86); 8.iv.56, bomb crater near IOW pond, *IFL* (86); Oxshott Heath, 19.ii.05 (3♀♀), *ECB* (NM); Esher Common, *JAP* (BM); 7.vi.1897, *GWK* (BM); 23.iii.31, *FJC* (SL); 17.ix.51, *HDS* (62); and beyond the boundary at Woking, *GCC* (BM); *GMK* (BM); and Chobham Common, 4.x.36, several ♂♂ & ♀♀, *ECB* (NM).

*Hesperocorixa moesta* Fieb. Sp. 492 p.385

D & S p.610 (*Corixa moesta*)
S p.336 (*C. moesta*)
B p.588 (Sp. 446, *C. moesta*)

Local. Like the previous species this also occurs on healthy commons and in woodland in pools and ponds, particularly those containing much organic detritus. It overwinters in the adult stage and pairing takes place in March and April. The larval stages take between 2-2½ months before new adults become evident. There are several records of this species taken at light in MV traps.

MIDDX. Greenford, 25.iv.03 ♂ & ♀, *ECB* (NM); Enfield (Wrotham Park), 8.iii.53 (2♂♂), 19.iv.53 (2♀♀), 20.ix.53 (5♀♀), 16.x.53 ♂, 13.xii.53♀, all from a large cattle pond with thick layer of silty detritus, pH 7, *IFL* (71); 11.x.53, *IFL* (86); 22.v.71 ♂ & 21.iv.72, *BSN* (58); South Mimms (Dyrham Park), 18.i.53 ♂ & 11.x.53 ♀, in overgrown ornamental pond, gravelly bottom with patches of detritus, pH 6.5 (western sector) — 7 (eastern sector), *IFL* (71); 18.i.53, *IFL* (86).

HERTS. Barnet, 7.v.74, *IFL* (86); (Hadley Green) pond, 19.iv.49, 17.vii.49, 8.v.50 & 5.ix.51 (open habitat pH 4.5), *IFL* (86); 25.ix.53, *IFL* (BM); 22.ii.53 (2♂♂ 1♀), 9.iii.53♀, 25.viii.53 (2♂♂ 4♀♀), 25.ix.53 (5♂♂ 3♀♀), 29.x.53 (1♂ 6♀♀), 15.xi.53♀, 6.xii.53 (11♂♂ 18♀♀) — all the from the same moderately large pond with fine gravelly bottom with silty detritus, and variable pH 4.5 — 7, *IFL* (71); 22.ii.53, 9.iii.53 & 6.xii.53, *IFL* (86); (S.W. Pond), 19.xii.71, locally common, *(BSN)* (58); Monken Hadley (Hadley Common), 13.xii. 53 ♀, in a small circular pond on the Common with bottom of silty detritus, branches and dead leaves, pH usually about 7, *IFL* (71); Radlett Gravel Pit. 25.ii.59 ♂ & ♀, *IFL* (33h) (86); Broad Colney. 21.i.51, in gravel pit, *IFL* (86); St Albans, n.d. [prior to 1933], in pond with clear stream running through it. *F. H. Day* (EMM [**69**], 155, 1933); Park Gate Gravel Pit, near Hatfield, 17.v.52, *IFL* (86); Hoddesdon (Broad Riding Wood), 28.x.61, a single ♀ from the largest pond, *BSN* (58); Haileybury (Roundings Pond), 12.xi.39, 9.xii.39, 11.xii.39, 10.iii.40, 27.iii.40, 9.vi.40 ♀, 30.vi.40 (2♀♀), xii.40 ♀ & 16.iii.41 ♀, all records of *ESB* (HD); 20.ix.39 & 12.iv.47 (2♂♂ 1♀), pond by Roman Road, *ESB* (HD); 15.iv.47, pond (42) by Roman Road, Hertford Heath, *ESB* (HD); near Hertford Heath, S. of Gt Amwell, 7.viii.40 ♂ & ♀, and 5.x.40, in small wood pond (HT3) approx. 30 yds diam., *ESB* (67a) (HD); Golding Wood near Hertford Heath, 7.x.40 ♀, artificial pond with concrete wall, *ESB* (67a); Hertingfordbury, 4.viii.40 (4♂♂), in pools in gravel pits on N.W. side of the Hertford-Hatfield Rd, near Cole Green, *ESB* (67a) (HD); near Hertford, 3.viii.40 ♂ & ♀, in stream near Foxholes, *ESB* (67a) (HD); Berkhampstead Common, 14.i.50, *ESB* (HD); Brickenden Liberty, 14.ii.62 (4♂♂ 1♀), in pond, *BSN* (58); and on the boundary at Waterford, 29.x.64, in gravel workings, locally common, *T. Lloyd-Evans* per *BSN* (58); and at Harpenden (Rothamsted Expt. Station grounds), 6.viii.50, a single ♀ taken in MV light trap, *ESB* (84).

ESSEX. Chingford, 8.ii.13, *EAB* (BM); Epping Forest (Fairmead Bottom) in bomb crater ponds — Pond A, 23.iii.52 (2♂♂ 3♀♀), 19.iv.52 (3♂♂ 7♀♀), 28.ix.52 ♀, Pond B, 23.iii.52 (7♂♂ 7♀♀), 19.iv.52 (4♂♂ 7♀♀), 28.ix.52 (44♂♂ 70♀♀), Pond C, 23.iii.52 (2♂♂ 5♀♀), 13.iv.52 (2♂♂ 3♀♀), 19.iv.52 (3♂♂ 1♀), 28.ix.52 (1♂♂ 5♀♀), Pond D, 19.iv.52 (4♀♀), 28.ix.52 (5♂♂ 5♀♀), all records of *IFL* (33f); bomb crater pond 2 (= B), 23.iii.72 and 28.ix.52, many examples, *IFL* (86); bomb crater pond 3 (=C), 13.iv.52, *IFL*

(BM) (86); 10.iv.52 & 28.ix.52 many ex ponds, *IFL* (86); bomb crater pond 4 (=D), 28.ix.52, *IFL* (86); (Monk Wood), n.d. [prior to 1923], *CN* (35a); (Loughton), 7.iii.1891, *AJC* (HD); 11.ix.11 and 30.iii.12, *EAB* (BM); 1.vi.30, *FJC* (SL); (Earl's Path Pond), 15.iii.53, *IFL* (86); (pond near the 'Robin Hood') n.d. [prior to 1923], *CN* (35a); (Wake Valley pond), 5.viii.40 (1♂ 3♀♀), *ESB* (HD); pond near the Wake Arms, 21.x.62 ♀, *T. Lloyd-Evans* per *BSN* (58); and small pool (about 10 yds diam.) outside the boundary of Epping Forest, 5.viii.40 ♂, *ESB* (67a); Little Parndon (Parndon Mill), 6.x.64, in single species in dyke, *BSN* (58); and on the boundary at Magdalen Laver, 22.x.62 ♂, in roadside pond, *BSN* (58).

KENT. Lee, *JAP* (BM); 16.iv.1898, at pond, *WW* (MM in *KCS* coll.) (39); 30.x.1897, pond in field in Hither Green Lane, *WW* (SL); [Westerham, *PH*, (22), the voucher specimen for this record is in the BM but there placed under *H. linnei* — see footnote *antea* p.100] and beyond the boundary at Higham Marshes, 21.iv.46 & 27.ix.46, in dykes, *AMM* (BM); and Bearsted, 7.iv.46, in pond in brickfield, *AMM*(BM); *GEW* (BM).

SURREY. Richmond Park, 4.iii.57 ♀, in Martin's pond, *DL* (EMM **93,** 216, 1957); 8.iv.55, *GEW* (BM); (White Ash Pond), 6.i.52, *DJC & JABo* (86); Wimbledon Common, 9.xii.51, 16.xii. 51 & 12.x.52, *DJC & JABo* (BM); 5.xii.53, in gravel pit, *DJC* (86); Shirley Common, 1.iv. 07, in pond in the wood, *WW* (62); Banstead, 21.vii.52 ♀ & 2.viii.52 ♀, at MV lamp, *AEG* (76) (1/**1952-53,** 12); Reigate, n.d., *JAB* in *ES* coll. (HD); Epsom Common, 14.ix.47, ponds, *ESB* (HD); 6.iv.66 ♂, in large clay pond [=Stew Pond], *BSN* (58); 29.iv.66, fairly common in small shaded pond next to the previous pond,* *BSN* (58); Bookham Common, 29.vii.50, *DL* (1/**1950-51,** 76); 28.iv.51 in IOW Pond, abundant amongst *Glyceria, DL* (34) (21) (EMM **87,** 183); 29.ix.51, *DL* (54); Oxshott Heath, 26.iii.05, *AJC* (HD); Esher Common, *JAP* (BM); *GCC*(BM); 7.v.04, *AJC* (HD); 23.ix.31 ♀, 5.x.31, 8.x.31, 23.x.31, and 29.x.31, *FJC* (SL); (Black Pond), 18.v.01, *SWK* (1/**1901,** 12); 19.v.01, *WW* (62); 23.iii.31 (several ♂♂ & ♀♀), *FJC* (SL) (1/**1931-32,** 49); 1922-25, in Black Pond and in temporary pools colonized by *Juncus bulbosus, OWR* (61); Ockham Common, 26.ix.25, *JEHR* (BM); and on the boundary at Byfleet, 4.v.47, in pond on outskirts of the town, *ESB* (HD) (1/**1947-48,** 60); and beyond at Chobham Common, vi.1896, *ES* (HD); Horsell Common, 26.iii.05 ♂, *ECB* (NM); 6.vi.31 & 8.vi.31, *FJC* (SL); Woking, *GCC* (BM); 5.iii.05, *AJC* (HD); and at the Basingstoke Canal between Pirbright Bridge and Frimley Green, 1954-55, *HDS* (50).

BUCKS. Beyond the boundary at Cholesbury Village pond, 10.ix.71 & 10.xii.71, in rich pond in *Elodea* among *Typha*, fairly common, *BSN* (58).

*Arctocorisa germari* (Fieb.) Sp. 493 p.385
B p.597 (Sp. 457, *Corixa germari*)

Rare. Although this bug has a scattered distribution throughout the British Isles it is mainly an upland species. The few London Area records are from ponds on grassy heaths. Little is known of its life-history except that overwintered females in the south lay eggs in mid-April. Middlesex and Bucks. records are required.

HERTS. Barnet (Hadley Green), 19.xii.71♂, in S.W. pond, *BSN* (58); Rye Meads (SNL 8 & 9), 2.xi.68, in effluent lagoons, (small SL), 2.xi.68 ♀, in effluent lagoon; (NL 1), 8.vii.61 ♀, in effluent lagoon; (NL 7), 27.ix.64 ♀, in small effluent lagoon with *S. concinna;* (NL 8), 21.x.67 ♂, in effluent lagoon,; (SL 14), 10.iv.66 ♂, in shallows of effluent lagoon; (SL 16), 23.ix.61 (2♀♀) & 30.ix.61 (1♂ 3♀♀), in effluent lagoon; (SL 17), 4.iii.62 ♂ & ♀, in effluent lagoon floating semi-torpid with *S. concinna,* disturbed by pump draining the lagoon; all these Rye Meads records of *BSN* (58); between Sandridge and Hatfield, 20.iii.59 ♀, in pond in association with other corixids, *IFL* (EMM **95,** 168, 1959); Broxbournebury, 18.x.70 ♂, in pool of 1.5 m depth, clear water, gravelly clay, with filamentous algae and *Myriophyllum* locally abundant, and *Potamogeton pectinata & P. natans;* between Stanstead Abbots and Rye Meads, 26.vi.65, six specimens netted in small pool in gravel workings, *BSN* (58); near Hatfield, 26.iv.59 ♂, in field pond (Pond D) N.W. of Astwick Manor, *IFL* (33h); and on the boundary at Stansborough Lakes (N.), 1.xi.70 ♂, in river-fed lake, *BSN* (58); and Wheathampstead, 8.vii.59 ♀, at MV light trap, *IFL* (EMM **95,** 168, 1959) (33h).

ESSEX. Rye Meads (Grid. ref. 394100), 28.viii.66, in temporary pool, adults and large nymphs common, *BSN* (58).

*This small pond is now lost, being inundated below a new large lake formed in 1975 (see *antea* p.262, footnote 2, *Lond. Nat.* **61:** 80, 1982)

KENT. Blackheath (Round Pond), 18.viii.81 ♂ (sub-teneral) & 6.ix.81 (2♂♂ 1♀); and at Orpington, 30.viii.49, *EG-S* (SL).

SURREY. Richmond Park, 21.iii.54 ♀, a small pond 200 yards from the N.W. shore of the Upper Pen Pond, *DL*(31i); Putney Heath, 2.ii.50, in Seven Post Pond, *C. P. Friendler* (EMM **86,** 218, 1950); Putney, vii.51, at MV light, *n.c.* (SL); Wimbledon Common, 23.viii.46, in Kingsmere, *EJP* (68b).

*Arctocorisa carinata* (Sahlb.) Sp. 494 p.386

S p.340 (*Corixa carinata*)
B p.597 (Sp. 456, *C. carinata*)

Southwood and Leston in their *Land and Water Bugs of the British Isles* state that this species has in the main a northern distribution and that 'all records for southern and central England are probably erroneous.' Butler in his *Biology of the British Hemiptera-Heteroptera* (1923), gives Surrey in his distribution, this probably being based on a specimen in the British Museum collection (with a duplicate also in the Hope Collections, Oxford), taken on Esher Common by G. C. Champion, almost certainly prior to 1875 (cited also in sources 37 and 3). Mr L. Jessop of the Dept of Entomology of the British Museum (Natural History) kindly examined the specimen for me and said that although it had in the past been determined as *C. sharpi* (now a synonym of *carinata*) there did not seem to be a positive match for *carinata,* particularly in the number of rows of teeth on the strigil which is a diagnostic feature in Macan's *Key to British Water Bugs,* p.54.

*Sigara (Sigara) dorsalis* (Leach) Sp. 495 p.388

Common and occasionally abundant. This bug occurs in rivers, ditches, canals, small lakes and in any ponds that have some flow of water (which is essential). All these habitats have in common a neutral or slightly alkaline pH value and a low amount of organic matter in solution. Overwintering adults pair in early spring and eggs are laid from late March to April. A second generation occurs, becoming mature towards the end of summer, and it is these adults that will overwinter. London Area records published as *S. striata* prior to 1956 are almost certainly *S. dorsalis* and have been included below, indicated by an asterisk. (See also note under next species).

MIDDX. Victoria, vii.69, near Vauxhall Bridge, a single specimen taken from the Tyburn River/Storm-water sewer, *AFW* (BM); Buckingham Palace grounds, 1962, common in the lake, *TRES* (52); Hampstead Heath, 1949, Viaduct Pond, *DL* (1/**1949-50,** 36-38)(EMM **85,** 253 & **86,** 130)*; 23.v.50, 26.vii.50 & 3.viii.50, *DL* (86); Southgate (Oakwood Park), 17.x.70, in Boxer's Lake, common, *BSN* (58); Enfield (Beech Hill Lake), 25.i.53 (3♂♂ 8♀♀), 15.ii.53 (9♂♂ 4♀♀), 8.iii.53 ♂, 26.iii.53 ♂ & ♀, 25.ix.53 (3♂♂).29.x.53 ♂, 6.xii.53 (2♂♂ 3♀♀), *IFL* (71); 28.i.53, *IFL* (86); 15.ii.53, *IFL* (86); 8.iii. 53, *IFL* (86); 26.iii.53, *IFL* (86); 25.ix.53, swampy area, *IFL* (BM); (Wrotham Park), 22.ii.53 ♂, 19.iv.53 (2♂♂ 4♀♀), 22.ix.53 (19♂♂ 20♀♀), and 13.xii.53 ♀, *IFL* (71); 8.iii. 53, *IFL* (86); 22.v.71, frequent in the large pond, *BSN* (58); (Trent Park), 10.viii.71, in East Lake, frequent, *BSN* (58); South Mimms (Dyrham Park), 18.i.53 (5♂♂ 6♀♀), 22.ii.53 ♂, 17.v.53 ♀, 11.x.53 (3♂♂ 2♀♀), in overgrown ornamental pond, *IFL* (71); 22.iii.53 (1♂ 3♀♀), 29.xi.53 (15♂♂ 11♀♀), in large pond, *IFL* (71); (Mimms Wash Stream), 29.iii.53 (59♂♂ 120♀♀), 3.iv.53 (30♂♂ 57♀♀), 8.v.53 (29♂♂ 62♀♀), 19.v.53 (4♂♂ 11♀♀), 20.ix.53 (11♂♂ 13♀♀), 29.xi.53 (11♂♂ 12♀♀), 20.xii.53 (2♀♀), and 10.i.54 (7♂♂ 3♀♀), *IFL* (71); 5.v.52 & 3.iv.53, *IFL* (86); Stanmore Ponds, 14.x.70, in sandy ponds, common, *BSN* (58); Ruislip LNR, 1963-64, the most abundant corixid in the Reserve, present in large numbers in the Main Pool and New Pond in August, but these decline by September apparently replaced by *S. nigrolineata, WFS* (49); Hanwell, 15.x.05, *AJC* (HD); Feltwell, 9.viii.53 (6♀♀) at MV light trap, *EWC* (EMM **89,** 281).*

HERTS. Whetstone, 20.vi.60 ♀, 1.vii.60 (1♂ 2♀♀), 28.viii.60 (3♀♀) and 29.viii.60 (1♂ 3♀♀), taken in MV light trap, *PHW (pers. comm.)* (47); 29.vi.61, in MV light trap, *PHW* (BM); Barnet (Hadley Green), 9.iii.53 ♂ & ♀, and 6.v.53 (3♂♂ 9♀♀), in a moderately large pond in the shallow area on the southern side, with fine gravelly bottom, silty detritus and no submerged vegetation, and 25.ix.53 (23♂♂ 28♀♀) & 25.xi.53 (21♂♂ 10♀♀) in the centre of the pond where there did not appear to be any vegetation — all records *IFL* (71); 11.i.53 (1♂ 4♀♀), 27.i.53 (3♂♂ 2♀♀), 22.ii.53 ♂, 23.iv.53 ♂, 25.ix.53 (3♂♂ 2♀♀), 29.x.53 ♂, 29.xi.53 (1♂ 2♀♀) & 13.xii.53 ♂, in a slightly larger pond than the previous

with a bottom mainly of coarse gravel with much detritus, *IFL* (71); 27.i.53 (2♂♂ 3♀♀), 22.ii.53 (5♂♂ 7♀♀), 9.iii.53 (2♂♂ 1♀), 6.v.53 (4♂♂ 12♀♀), 25.viii.53 (12♂♂ 10♀♀), 25.ix.53 (37♂♂ 47♀♀), 29.x.53 (7♂♂ 5♀♀), 22.xi.53 (31♂♂ 24♀♀), and 13.xii.53 (4♂♂ 3♀♀), in small circular pond about 100 yards from the larger pond, with dead elm leaves on the bottom at one side and with bare coarse gravel for the rest, pH usually about 7, *IFL* (71); 25.ix.53, ex. pond, *IFL* (BM); 30.x.70, in Pond W., fairly common, *BSN* (58); 29.v.71, in both S.W. & N.W. ponds, fairly common in both, *BSN* (58); 21.v.72, in Brewery Pond, two examples in weed, *BSN* (58); Monken Hadley (Hadley Common), 30.x.70, in weedy pond, common, *BSN* (58); Totteridge, 19.ix.37, in pond by roadside, *GAW*(67b*); 4.vi.44, *CHA (17*);* Aldenham Reservoir, 29.i.53, *IFL* (86); 14.x.70, a single example in shallow reservoir, *BSN* (58); Cassiobury Park (River Gade), 30.x.70, shallow river, frequent, *BSN* (58); Watford (Grand Union Canal), 30.x.70, in canal, locally frequent to common, *BSN* (58); Watford (E.) (River Colne), 30.x.70, in shallow river, fairly common, *BSN* (58); Rickmansworth, 15.viii.16, IV instar larva, *EAB* (BM); 22.iv.51 and 23.iii.57, *WJLeQ* (21); *EAB* (11*) (12*); (River Chess), 15.vii.53, *IFL* (86); about 1 mile S.W. of Rickmansworth, 16.i.77, in small weedy pool fouled by sheep, *PAN* (78); West Hyde, 17.xii.71, in old cress beds, frequent, *BSN* (58); Radlett Gravel Pit, 25.ii.59 and 16.iii.59 ♀, *IFL*; (33h); Colney Street (River Ver), 1.x.71, in shallow river, locally frequent to common, *BSN* (58); Old Parkbury, 10.xii.64, in small pools of gravel workings, common, *BSN* (58); Broad Colney (River Colne), 1.x.71, in shallow river, frequent, *BSN* (58); Broad Colney Gravel Pit, 21.i.51, *IFL* (86); London Colney Gravel Pit, 25.ii.59 ♀ *IFL* (86) (33h); London Colney (River Colne), 14.x.70, common, *BSN* (58); Colney Heath (River Colne), 28.viii.71, in shallow river, locally frequent, *BSN* (58); near Hatfield Park Gate gravel pits, 4.v.52, *IFL* (86); Smallford (Old Gravel Pit), 17.xii.71, in mature gravel-pit pool, frequent, *BSN* (58); St Albans (River Ver), 29.vii.51, *IFL* (86); (Verulamium), 14.x.70, two specimens in River Ver, *BSN* (58); (Oaklands), 17.xii.71, in gravel-pit pool, frequent, *BSN* (58); Brookman's Park (Gobion's Pond), 5.x.64, frequent, *BSN* (58); North Mymms (Water End), 5.x.64, in Mimmshall brook, very common in draught pools, *BSN* (58); 29.vii.51, in River Mimmshall, *IFL* (86); Potter's Bar Park, 22.x.70, in Upper Lake, locally frequent, *BSN* (58); 22.x.70, pond in pasture, a single specimen, *BSN* (58); Cheshunt, *EAB* (11*) (12*); 6.iv.12, *EAB* (BM); 17.viii.60, three specimens taken in the canal, *AAA* (51); (Turnford), 22.x.70, in River Lee canal, frequent, *BSN* (58); (Old River Lea), 18.viii.71, very rich slow river, frequent, *BSN* (58); (Hooke's Marsh), 18.viii.71, recent gravel pit, fairly common, *BSN* (58); 22.x.70, in dyke, with much emergent *Sparganium, Carex,* etc., fairly common, *BSN* (58); (Cadmore Lane Gravel Pit), 18.viii.71, in mature gravel pit, two examples, *BSN* (58); Wormley (King's Weir), 7.iv.62 ♂, in old River Lea, *BSN* (58); Broxbourne, 13.iv.47 ♂, in pool, *ESB* (HD); 1.v.62 ♂ & ♀, in Lea Navigation, *BSN* (58); Hoddesdon (Barclay Park), 17.iv.62, in lake (♀) and in the brook (♀), *BSN* (58); Rye Meads (small SL), 2.xi.68, in effluent lagoon, frequent; (SL East Channel), 7.viii.71, in effluent ditch, adults frequent and immature larvae common, and 15.viii.71, adults fairly common, immature larvae common; (SL effluent stream), 17.x.70, common in water cress; (SL/Wks), 20.x.68, in slow stream, common to locally abundant; (SL), 30.ix.61 ♂, effluent lagoon, (SL 10), 21.x.67 ♂, and 17.x.70 (frequent on *Typha*); (SL 10 N.E. Corner), 19.iv.69, a single specimen; (SL 15), 4.x.64, in effluent lagoon, frequent with *Callicorixa praeusta;* (SNL 8 & 9), 2.xi.68, effluent lagoons; (NL), 22.x.61 ♂, in roadside ditch with *Sigara nigrolineata;* (NL Hut Pool), 21.x.67, fairly common; (NL 1), 21.iv.68, in weedy effluent channel, fairly common; 31.vii.65, effluent lagoons, adults & immatures frequent; 8.vii.61, in effluent lagoon, a single example; (Ditch NL 1/S.E.), 19.iv.69, common; (NL 2 & 4), 27.ix.64, effluent lagoon, very common under marginal vegetation; (NL 3 & 4), 14.iv.62 (2♂♂ 7♀♀), effluent lagoon and ditch; (NL 4), 10.iv.66, small pond by hut, frequent; (NL 4-5), 22.x.61 (6♂♂ ♀♀), in effluent lagoon with *Callicorixa praeusta;* (NL 7), 21.x.67 (2♀♀), in lagoon; (NL 8), 24.ix.64 ♀, effluent lagoon, with *Sigara concinna;* (NL 9), 19.vi.71, effluent lagoon, frequent; 21.x.67 (2♀♀), lagoon fairly common; (NL/meads), 28.x.61, 3♂♂ 6♀♀ in sluggish stream and 5♂♂ 14♀♀ in deep pool; (N. Meadow Pond), 11.xii.71, deep pond, very common in clear water especially by N. bank which is steeper; 18.iii.72, deep pool, fairly common to locally common; (S. of railway), 8.xi.64, very common in effluent stream and common in R. Stort; (River Stort), 26.vii.65, three examples taken; (Stort Navigation), 9.v.63 (3♀♀); (Lee Navigation), 19.v.63, four examples; (Stanstead Abbots), 26.vi.65, gravel workings, common in gravel pits pools; (E. Gravel Pit), 11.x.70, new flooded gravel pit, fairly common and in small gravel pit pool, frequent; (Gravel Pit W. Pool), 25.iii.72 and 8.iv.72, fairly common in rich pool; (Old Gravel Pit), 8.iv.72, deep mature gravel pool, locally frequent; (Toll House Stream), 24.vii.71 & 17.x.70, in shaded dyke, frequent; (Stream by house), 19.iv.69, common; Rye Meads, meads 11.x.64, a) peat pool, very common, b) gravel pit, very common, c) old pond, common, and d) ditch, common; all the above Rye Meads records are of *BSN* (58); Gt

Amwell (River Lea), 7.x.39 & 28.iii.40, *ESB* (HD); River Lea, 6.viii.40 (3♂♂ 5♀♀), halfway between Hoddesdon and Rye House, *ESB* (67a*); 6.viii.40 (4♂♂ 4♀♀), below the weir just E. of Hoddesdon, *ESB* (67a*); Haileybury, 20.ix.39, pond by Roman Road, *ESB* (HD); 14.v.39, pond in Golding's Wood, *ESB* (HD); 27.iii.40 & 9.iv.40 ♂ & ♀, pond on the Roundings, *ESB* (HD); near Hertford, 3.xii.49 ♂, lake in Gilsborne Park, *ESB* (HD); near Jenningsbury, 10.iv.40 ♂ & ♀, in pond by the Hertford-Hoddesdon road, *ESB* (67a*) (HD); Jenningsbury moat, 1 mile S. of Hertford, 3.viii.40 (♂ & 2♀♀), *ESB* (67a*) (HD); Hertfordbury, 4.viii.40 ♂, pools in gravel pits near Cole Green, *ESB* (67a*) (HD); Brickenden (Ettridge Farm), 11.x.64 & 1.v.71, in farm pond, fairly common, *BSN* (58); and on the boundary at Lemsford Springs, 10.x.71, outflow sump, locally common, *BSN* (58); 22.viii.71, in watercress beds, fairly common, *BSN* (58); and beyond at Wheathampstead, vii-ix.59 (36 examples) taken in MV light trap situated in small orchard of fruit trees, *IFL* (33h) Harpenden (Rothamsted Expt. Station grounds), 1933-36, taken in light trap, *DCT* (59); 4.viii.50 ♀, 6.viii.50 (27♂♂ 23♀♀), 7.viii.50 (3♂♂ 2♀♀), 13.viii.50 (3♂♂ 2♀♀), 20.viii.50 ♂ and ♀, and 21.viii.50 (30♂♂ 57♀♀), all taken in MV light trap, *ESB* (84).

Essex. Epping Forest, 10.vii.42, *PJLR* (20*); (Connaughts Water), 22.x.64, in lake, frequent, *BSN* (58); (Fairmead Bottom), 13.iv.52, in Pond A, *IFL* (86); (Loughton), 10.ix.14, IV instar larva, *EAB* (BM); 22.x.64, in ponds, *T. Lloyd-Evans* per *BSN* (58); (Wake Valley pond), n.d. [prior to 1923], *CN* (35a*); 5.viii.40 ♀ and 3.ix.40 ♂, *ESB* (67a*) (HD); Waltham Abbey (Cornmill Stream), 22.x.70, in rich dyke, frequent, *BSN* (58); Epping (Lindsey Street), 25.ix.64 (3♂♂ 1♀), in village pond, *BSN* (58); (Epping Plain), 25.ix.64 (3♂♂ 1♀), in lake, *BSN* (58); (Tiln Kiln Ponds), 25.ix.64 (1♂ 3♀♀), in small lake, *BSN* (58); Fisher's Green (King's Weir), 23.vi.65, in gravel working, 2 adults and numbers of nymphs at edge of flooded gravel pit, *BSN;* Epping Upland (Chambers Manor), 25.ix.64 ♂, in cattle pond, *BSN* (58); Nazeing (Paynes Lane), 20.x.61 (2♀♀), in gravel pit, *BSN* (58); (Middle Street), 29.ix.64, roadside pond, common, *BSN* (58); Roydon Meads (River Stort), 22.viii.71, in pool of fast river, a single specimen, *BSN* (58); Gt Parndon (Katherine's), 23.x.64, in disused farm pond, *BSN* (58); Little Parndon (Parndon Hall), 19.x.62 ♂ & ♀, *BSN* (58); (Parndon Mill), 6.x.64, in dyke, very common, *BSN* (58); 5.x.64, in River Stort, abundant with *Sigara falleni*, and in the overflow, frequent, *BSN* (58); Burnt Mill (Stort Navigation), 15.viii.71, a single specimen in canal, *BSN* (58); Potter Street (Harlow Common), 22.x.62, and 30.x.64, in duck pond (clay), common, *BSN* (58).

Kent. Blackheath, 27.xi.57, in shallow barren pond on the Heath, one living and one dead specimen found, *AAA* (40) (22); 1958-61, in garden pond at 63 Blackheath Park, *AAA* (40); 9.xi.78, plentiful in the Hare & Billet Pond 'when in a dirty (?polluted) and otherwise barren state with almost no vegetation and no other insects or invertebrates except the snail *Limnaea stagnalis* which was not uncommon.', *AAA* (40); Abbey Wood Marshes, 15.x.58, two specimens in weedy dyke, *AAA* (40) (22); Lee, *JAP* (BM); 30.x.1897, pond in field, Hither Green Lane, *WW* (60*) (4*) (39) (22) (SL); Catford, *WW* (4*) (39) (22); Ruxley Gravel Pit, 15.xii.62, *KCS* (22) (14) (MM); Dartford Marshes, 5.x.52 and 19.vii.53, ex dyke, *IFL* (58); Stone, near Dartford, 11.iv.55, *KCS* (14); and beyond the boundary at Higham Marshes in dyke, 29.iii.38, 21.iv.46 and 28.ix.46 (abundant), *AMM* (BM); 2.v.65, *AMM* (1/**1965,** 57) (22); 5.ix.63, *KCS* (14) (MM).

Surrey. Anerley, *JS* (BM); Richmond Park, 21.iii.54 ♂, in small pond (SR 18) 200 yards from the N.W. shore of the Upper Pen Pond, *DL* (31i); 21.iii.54 (1♂ 3♀♀), in small open pond (SR 19) 100 yards N.E. of Ham Gate, *DL* (31i*); in open pond (SR 20) quite close to Ham Gate, 27.viii.46, *EJP* (68b*) and 21.iii.54 (13♂♂ 9♀♀), *DL* (31i*); 27.viii.46, two small ponds (SR23) on E. side of large pond south of the road from Ham Gate to Richmond Gate, *EJP* (68b*); 27.viii.46, Leg of Mutton Pond (SR 16) about ¼ mile W. of Robin Hood Gate, *EJP* (68b*); 1934-38, Pen Ponds, *EJP* (68b*); Wimbledon Common, 21.x.51 and 12.x.52, *DJC & JABo* in *IFL* coll. (86); Banstead, 19.vii.52 (4♂♂ 2♀♀), 20.vii.52 (13♂♂ 16♀♀), 21.vii.52 (5♂♂ 3♀♀), 22.vii.52 (2♂♂ 1♀), 25.vii.52 (6♂♂ 10♀♀); 26.vii.52; (10♂♂ 16♀♀) and 2.viii.52 (40♂♂ 48♀♀) at MV lamp, *AEG* (76); 3.viii.53 ♂, at MV lamp, *AEG* (EMM **90,** 166, 1954); 22.vii.52, at light, *AEG* (1/**1952-53,** 12*) (EMM **90,** 166*); Limpsfield, 26.iii.45, *CHA* (17*); Tadworth, 30.iii.74, pond in Chapel Road, *RRF* (66); Burgh Heath, 18.vii.70, a single specimen in shallow sandy pond [= The Mere], fairly common, *BSN* (58); Epsom Common, 6.iv.66, in large shallow pond near 'The Cricketers', frequent, *BSN* (58); 6.iv.66 and 29.iv.66, in small lake [=Stew Pond], *BSN* (58); Bookham Common, 29.ix.51, in IOW Pond, *DL* (34*); Esher Common, 1922-25, in deep temporary pools colonized by *Juncus bulbosus, OWR* (61*); and on the boundary at Byfleet, 2.vii.32 ♂, and 3.vii.32 ♂, *FJC* (SL); Byfleet Canal, 3.vii.32 ♀, *FJC* (SL); and beyond at Horsell Common, 16.ix.31 (2♂♂), *FJC* (SL); Woking, 23.v.31 ♂, *FJC* (SL), and Gomshall, viii.1892, *EAB* (BM).

BUCKS. Denham (River Colne), iv.35, *DCT* (RSM); and on the boundary at Latimer (River Chase), 10.ix.71, in fast river, common, *BSN* (58); and beyond at Cholesbury, 20.ix.81 (2♀♀), *WJLeQ* (21); 10.ix.71, in rich village pond, common, *BSN* (58); and at Sheepcote near Aylesbury, 13.iv.40, in pond, *ESB* (HD).

*Sigara (Sigara) striata* (Linn.) Sp. 496 p.389

D & S p.606 (*Corixa striata*)
S p.335 (*C. striata*)
B p.584 (Sp. 443, *C. striata*)

The true *striata* has only been recorded near Rye and adjacent Romney Marsh (see remarks in Southwood and Leston's *Land and Water Bugs of the British Isles*, p.389, and to the footnote to Leston's papers in EMM **91,** 92-95, 1955 and *J. Soc. Br. Ent.* **5,** 153-8, 1956. In view of this opinion all Home Counties records (which would include the London Area ones that lie within the scope of this paper) published or determined prior to 1956 should be referred to the previous species i.e. *Sigara dorsalis*. Such records have therefore been included thereunder, indicated by an asterisk.

*Sigara (Subsigara) fossarum* Leach Sp. 497 p.390

D & S p.611 (*Corixa fossarum*)
S p.338 (*C. fossarum*)
B p.590 (Sp. 447, *C. fossarum*)

Frequent and sometimes locally common. Found in ponds, lakes (particularly on clay) with still or slow flowing water and often a lot of pondweed (e.g. *Elodea*). Such waters are usually alkaline and contain much undissolved organic material. Overwintered females lay eggs in early spring and the larvae reach maturity in late July-early August. The second generation which becomes adult by October survives the winter. *S. fossarum* is often found bearing one or more parasitic larvae of hydrachnids which usually affix themselves to the posterior tibia (*fide* Butler, p.590). Bucks. records are required.

MIDDX. Hampstead Heath, 1949, in Viaduct Pond, *DL* (1/**1949-50,** 36-38); 16.viii.49, in pond on the Heath, *DL* (31a); 17.viii.49, *DL*(C); 3.viii.50 in Viaduct Pond, *DL* in *IFL* coll. (86); Enfield (Beech Hill Park lake), 15.ii.53 ♂, *IFL* (71); 28.i.53 and 25.viii.53, *IFL* (86); (Wrotham Park), 22.ii.53, *IFL* (86), 4.v.53 ♂, *IFL* (71); South Mimms (Mimms Wash Stream), 8.v.53 and 21.iii.54, *IFL* (86); (Dyrham Park), 18.i.53 (2♂♂ 6♀♀), 19.iv.53 ♂ & ♀, 17.v.53 (1♂ 2♀), 20.ix.53 (3♂♂), 11.x.53 (19♂♂ 20♀♀), and 29.xi.53 ♀, *IFL* (71); 18.i.53 and 17.v.53, *IFL* (86); Hendon, 1.xi.02, *ECB* (NM); Stanmore, 26.viii.51, *IFL* (86); Stanmore Park, 28.xi.51, in Spring Pond, *PNL* in *IFL* coll. (86).

HERTS. Barnet (Hadley Green), in moderately large pond, locus A, 6.v.53 (2♂♂ 1♀) and 25.viii.53 (3♂♂ 1♀); locus B. 22.ii.53 (3♂♂ 5♀♀), 9.iii.53 (2♂♂), 25.iv.53 (3♂♂), 15.xi.53 (12♂♂ 21♀♀) and 13.xii.53 (1♂ 2♀♀); locus E, 25.ix.53 (10♂♂ 13♀♀), and locus F, 25.ix.53 (3♂♂ 1♀), *IFL* (71); Pond A, 22.ii.53 and 26.iv.53, Pond C, 6.v.53, and Pond D, 26.iii.53 and 6.v.53, *IFL* (86); in S.W. Pond, 19.xii.71, frequent, *BSN* (58); in E. Pond, 29.v.71 ♂ & ♀, *BSN* (58); Totteridge, 19.ix.37, pool by the roadside, *EJP* (67b); Radlett Gravel Pit, 25.ii.59, pond in the pit, *IFL* (86); London Colney, 25.ii.59 ♂, pond near gravel pit, *IFL* (33h); Smallford Gravel Pit, 17.xii.71, in old, mature gravel pit, fairly common, *BSN* (58); Brookman's Parks (Gobion's Pond), 5.x.64, a single example, *BSN* (58); Hatfield, 20.iii.59, *IFL* (EMM **95,** 168, 1959); Cheshunt (Old River Lea), 18.viii.71 (2♂♂), in very rich, slow river, *BSN* (58); (Hooke's Marsh dyke), 22.x.7♂♂, in rich dyke, *BSN* (58); (Lee Navigation, Turnford) 22.x.70, in canal, frequent, *BSN* (58);Rye Meads (Gravel Pit, West Pool), 25.iii.72, rich gravel pit pool, locally frequent to common, *BSN* (58); (small SL), 2.xi.68, effluent lagoon, *BSN* (58); (SN 8 & 9), 2.xi.68, effluent lagoon, *BSN*, (58); (S. of railway), 31.i.71, in effluent ditch, frequent, *BSN* (58); (pool adjacent to old/new GP), 16.v.71 ♂, in gravel-pit pool (flow), *BSN* (58); Jenningsbury Moat, 23.v.60 (1♂ 7♀♀), in stretch 20 yards long, black mud devoid of vegetation, *ESB* (67a); 23.v.40 (2♂♂ 2♀♀) and 30.v.40, *ESB* (HD); on the boundary at Barwick Ford, 29.x.64, in River Rib, frequent, *T. Lloyd-Evans* per *BSN* (58); Lemsford Springs, 22.viii.71 ♀, in watercress beds, *BSN* (58); Waterford Marsh, 17.v.62 ♂, in River Beane, *BSN* (58); Symondshyde, N.W. of Hatfield, 26.iv.59 and 27.vii.59, in Pond D, *IFL* (86); and beyond Wheathampstead, 8.vii.59 (1 example) in MV light trap situated in a small orchard of fruit trees, *IFL* (33h); and at Harpenden (Rothampsted Expt. Station grounds), 6.viii.53, to light, *DCT* (12) (59); 6.viii.50 ♀, taken in MV light trap, *ESB* (84).

Essex. Epping Forest (Chingford), 2.xi.12 and 20.xii.12, *EAB* (BM); 20.xii.12, *EAB* (RSM ex. *T.V.Campbell* coll., presented 1931); ponds near the 'Robin Hood'), n.d. [prior to 1923], *CN* (35a); (Fairmead Bottom) bomb crater ponds — Pond A. (diameter 15-20 ft, with depth *circa* 5 ft in centre) — 23.iii.52 ♂ and 19.iv.52 (1♂ 4♀♀), *IFL* (33f); bomb crater pond III (=C), 15.iii.53, *IFL* (86); (Golding's Hill Pond), 2.vii.40 (7♂♂ 3♀♀), *ESB* (67a) (HD); (Earls Path Pond), 15.iii.53, *IFL* (86); (Loughton), 22.x.64, in ponds, frequent, *T. Lloyd-Evans* per *BSN* (58); Epping (Epping Plain Lake), 29.ix.64 (3♂♂ 3♀♀), *BSN* (58); and beyond the boundary at Matching, 24.x.62 ♀, in lake, *BSN* (58), and Matching Green, 16.x.62 (2♀♀) in village pond, *BSN* (58).

Kent. Dartford Marshes, 5.x.52, ex dyke, *IFL* (86); and on the boundary at Gravesend, *JAP* (BM); and beyond at Higham Marshes, 28.ix.46, in dykes, common, *AMM* (BM) (22).

Surrey. Richmond Park, 27.viii.46, in a small pond (SR 18) 200 yards from the N.W. shore of the Upper Pen Pond, *EJP* (68b), 27.viii.46, in large open pond (SR 22) situated on the S. side of road from Ham Gate to the Richmond Gate, *EJP* (68b); 27.viii.46, two small ponds (SR 23) on E. side of the previous pond, *EJP* (68b); 27.viii.46, in bomb crater (SR 24) between pond SR 22 and the road, *EJP* (68b); 21.iii.54 ♂ & ♀, in small open pond (SR 19) 100 yards N.E. of Ham Gate, *DL* (31i); 21.iii.54 (5♂♂ 5♀♀), in open pond (SR 20), quite close to the Ham Gate, *DL* (31i); Wimbledon Common, 23.iii.54 ♂, in open pond (SR 3) on S side of the Portsmouth Road, ½ mile S.E. of Roehampton, *DL* (31i); 23.iii.54 ♀, in large closed pond (SR13) near Putney-Wimbledon Road, situated ½ mile from the Wimbledon end of Wimbledon Common, *DL* (31i); 21.x.51, 16.xii.51, 12.x.52 and 18.i.53, *DJC & JABo* in *IFL* (86); Epsom Common, 6.iv.66, in lake on clay [= Stew Pond], *BSN* (58); 29.iv.66, in lake on clay [=Stew Pond], very common, co-dominant especially near edge, *BSN* (58); 24.iv.70 ♂ and ♀, in Stew Pond, *BSN* (58); Bookham Common, 29.ix.51, in IOW pond, *DL* (34); 14.viii.60, *DL* (HD); Esher Common, *JAP* (BM); in small pond near the Black Pond, 23.iii.31 ♂, *FJC* (62) (SL) (1/**1931-32,** 49); and just see over the boundary at Byfleet, vi.1876, *ES* (BM); (Basingstoke Canal), 4.v.47, in neighbouring streams, *SL* (1/**1946-47,** 60); and beyond at Chobham Common, iv.1876, *ES* (BM) (HD); Horsell Common, 2.vi.31 (2♀♀) and 6.vi.31 ♂, *FJC* (SL); and in the Basingstoke Canal between Pirbright Bridge and Frimley Green, 1954-55, *HDS* (50).

Bucks. Beyond the boundary at Sheepcote near Aylesbury, 13.iv.40 ♀, in pond, *ESB* (HD).

*Sigara (Subsigara) scotti* (Fieb.) Sp. 498 p.390

S p.338 (*Corixa scotti*)

B p.591 (Sp. 449, *C. scotti*)

Rare. Although Southwood and Leston in their *Land and Water Bugs of the British Isles* give Scotland, Ireland, northern England and upland Wales as being the main distribution for this species, they state that it also occurs in isolated populations in coastal southern England, from whence, since the turn of the century, it has slowing spread inland in the south-east, always in acid peaty pools. In the south two generations occur; the overwintering adults pair in early spring and the larvae from this generation become mature in April and May. The second generation adults are found from late August onwards. Kent, Essex and Bucks. records required.

Middx. Hampstead Heath, 3.viii.50, in Viaduct Pond, *DL* in *WJLeQ* coll. (21).

Herts. Barnet (Hadley Green) in a moderately large pond where it has occurred abundantly, pH 4.5-7, Locus A, 9.iii.53 (13♂♂ 18♀♀), 26.iv.53 (14♂♂ 18♀♀), 6.v.53 (9♂♂ 24♀♀), 25.viii.53 (17♂♂ 17♀♀), 25.ix.53 (15♂♂ 16♀♀), 29.x.53 (6♂♂ 6♀♀), 15.xi.53 (19♂♂ 12♀♀) and 13.xii.53 (13♂♂ 9♀♀), Locus B, 29.x.53 (16♂♂ 16♀♀), 15.xi.53 (20♂♂ 26♀♀) and 13.xii.53 (13♂♂ 12♀♀), Locus C, 25.viii.53 (14♂♂ 13♀♀), 25.ix.53 (11♂♂ 10♀♀), 29.x.53 (28♂♂ 21♀♀), 15.xi.53 (9♂♂ 11♀♀) and 13.xii.53 (13♂♂ 15♀♀), Locus E, 25.ix.53 (4♂♂ 9♀♀), Locus F, 6.v.53 (9♂♂ 23♀♀), 25.ix.53 (18♂♂ 41♀♀) and 15.xi.53 (17♂♂ 17♀♀), and in a small circular pond with pH usually about 7[*sic*], 22.xi.53 (10♂♂ 2♀♀) — all records of *IFL* (71); (Hadley Green), 25.ix.53, ex. pond, *IFL* (BM).

Surrey. Richmond Park, 4.iii.57, in Martin's pond, *DL* (EMM **93,** 216, 1957); Headley, 3.iii.56, *JCD* (BM); Esher Common, *JAP* (BM); and just on the boundary at Wisley, 21.x.68 (3♂♂), in Boldermere, a large lake on the sand, *BSN* (58); and beyond at Thursley Common, 30.viii.73, in Sankey's Pool, *RRF* (66); 22.vi.83, in Moat Pond, *JB* (85); Elstead Common, 19.vii.53, *LC* (64).

*Sigara (Subsigara) falleni* Fieb. Sp. 499 p.391

D & S p.607 (*Corixa falleni*)
S p.336 (*C. falleni*)
B p.587 (Sp.445, *C. falleni*)

Common and widespread. This species occurs where there is some flow of water; in ponds, ditches, stream, smaller lakes and slow rivers, particularly where marginal plants provide shelter. Overwintering adults pair in March and eggs are laid during the next six weeks, the larvae taking a further two months before maturing at the end of June. These adults pair in July and a second generation matures at the end of August to later overwinter. Bucks. records required.

MIDDX. Hampstead Heath, 16.viii.49, pond on the Heath, *DL* (EMM **85,** 253, 1949); 17.viii.49, in Viaduct Pond, *DL* in *SW* coll. (C); 1949, in Viaduct Pond, *DL* (1/**1949-50,** 36-38); 26.vii.50, *DL* in *WJLeQ* coll. (21); 3.viii.50, *DL* in *IFL* coll. (86); Southgate (Oakwood Park), 17.x.70, in Boxer's Lake, fairly common, *BSN* (58); Enfield (Ponder's End), 17.vi.42 (2♀♀), in pools, *ESB* (HD); (Trent Park), 10.viii.71, in eastern lake, locally common, *BSN* (58); (Beech Hill Park lake), 28.i.53 ♀, 15.ii.53 (1♂ 4♀♀), 8.iii.53 ♂, 25.viii.53 (1♂ 2♀♀), 25.ix.53 ♀, and 29.x.53 ♂, *IFL* (71); 25.ix.53, swampy area, *IFL* (BM); 15.ii.53 and 25.viii.53 *IFL* (86); (Wrotham Park), 22.ii.53 (2♀♀); 8.iii.53 ♂, 19.iv.53 (2♂♂ 6♀♀), 4.v.53 (20♂♂ 30♀♀), 13.v.53 (16♂♂ 13♀♀), 20.ix.53 ♂, 11.x.53 (11♂♂ 14♀♀) and 13.xii.53 ♂, *IFL* (71); moderately common in cattle pond in Wrotham Park, *IFL* (74); 8.iii.53, *IFL* (86); in rich pasture pond, 22.v.71 (fairly common) and 21.iv.72 (frequent), *BSN* (58); South Mimms (Dyrham Park), 18.i.53 (3♂♂ 6♀♀) and 11.x.53 ♂, large pond with detritus covered bottom, *IFL* (71); (Mimms Wash Stream), 10.i.54 ♂, *IFL* (71); 15.v.52, *IFL* (86); Hendon, 1.xi.02, *ECB* (NM); Edgware (Scratch Wood), 28.v.44, *CHA* (17); Stanmore ponds, 14.x.70, fairly common in acid ponds, *BSN* (58); Feltham, 9.viii.53 (3♂♂ 5♀♀), at MV light trap, *EWC* (31k); Ruislip LNR, 1963-64, occurs in the Main Pool during autumn when its numbers seem to fluctuate very widely compared with those of *Sigara dorsalis*, *WFS* (49).

HERTS. Whetstone, 29.viii.60 ♂, taken in MV light trap, *PHW* (pers. comm.) (47); Barnet (Hadley Green) in moderately large pond, with pH variable between 4.5-7, Locus A, 9.iii.53 (3♂♂), Locus B, 15.xi.53 (4♂♂), 13.xii.53 ♂ & ♀, Locus E, 25.ix.53 (3 ♂♂ 5♀♀) and Locus F, 6.v.53 (1♂ 3♀♀); in slightly larger pond than the previous one, with bottom mainly of coarse gravel with mud detritus, 11.i.53 ♂, 27.i.53 (2♀♀) and 23.iv.53 ♀; small circular pond with dead leaves on the bottom at one side and bare, coarse gravel for the remainder, pH usually about 7, 27.i.53 ♂ and 22.xi.53 (2♂♂) — all records of *IFL* (71); 25.ix.53 ex. pond, *IFL* (BM); 30.x.70 ♂, in W.pond, *BSN* (58); 19.xii.71, in S.W. pond, frequent, *BSN* (58); 29.v.71 ♀, in rich EE Pond *BSN* (58); 21.iv.72, in Brewery Pond, a single example among weed, *BSN* (58); 10.iv.49, 17.iv.49, 16.vii.49 28.ix.49 and 29.iii.50, *IFL* (86); Monken Hadley (Hadley Common), 25.ix.53 (4♂♂ 10♀♀) and 22.xi.53 (7♂♂ 6♀♀), *IFL* (71); Totteridge, 19.ix.37, in pool by roadside, *GAW* (67b); Aldenham Reservoir, 14.x.70, a single specimen in shallow reservoir, *BSN* (58); Watford E. (River Colne), 30.x.70, in shallow river, frequent, *BSN* (58); Rickmansworth, 15.viii.16, *EAB* (BM); 22.iv.51 and 23.iii.57, *WJLeQ* (21); (River Colne), 14.x.70, common, *BSN* (58); (River Chess), 15.vii.53, *IFL* (86); (Stocker's Lake Gravel Pit), 15.vii.53, *PNL* in *IFL* coll. (86); about 1 mile S.W. of Rickmansworth, 16.i.77, in a small weedy pool (2-3 ft deep), fouled by sheep, *PAN* (78); 1½ miles N.of Chorley Wood, 10.ix.71 ♂, in River Chess at Sarrat Mill in fast river, *BSN* (58); Maple Cross Gravel Pit, 14.x.70, mature gravel pit, frequent, and 17.xii.71, common, *BSN* (58); West Hyde, 17.xii.71, a single specimen in old watercress bed, *BSN* (58); Radlett Gravel Pit, 25.ii.59 ♂ and 16.iii.59, *IFL* (33h); Coiney Street (River Ver), 1.x.71, in shallow river, locally frequent, *BSN* (58); Broad Colney (River Colne), a single specimen in gravel pit pool, *BSN* (58); London Colney (River Colne), 14.x.70, common, *BSN* (58); Tyttenhanger Gravel Pit, 19.xii.71, in gravel-pit pool, frequent, *BSN* (58); Smallford, 5.x.64 ♀, in gravel working, and 17.xii.71, in mature gravel pit, common, *BSN* (58); Colney Heath (River Colne), 30.x.70, in shallow river, *BSN* (58); Colney Heath (River Colne), 30.x.70, in shallow river, *BSN* (58); Starborough Lakes N., 1.xi.70, river-fed lake, frequent, *BSN* (58); 5.xii.71, fairly common in 1-1¼m of clear water with dense stonewort on bottom, *BSN* (58); Brookman's Park (Gobion's Pond), 5.x.64, very common, dominant, *BSN* (58); Cheshunt, 6.iv.12, *EAB* (BM) (11); Cadmore Lane Gravel Pit), 18.viii.71, in mature gravel pit, *BSN* (58); (Hooke's Marsh S. gravel pit), 22.x.70, in gravel lagoon, fairly common, and 18.viii.71, in recent gravel pit, *BSN* (58); (Old River Lea), 18.viii.71, very rich slow river, locally frequent to common, *BSN* (58); (River Lea, Turnford), 22.x.70, in canal, abundant, *BSN* (58); (Hooke's Marsh), 22.x.70, in dyke, fairly common, *BSN* (58); (Lee Navigation), 18.viii.71 (2♂♂) in canal by the 'Jolly

Bargeman', and 18.viii.71, in canal below lock, locally common, *BSN* (58); Rye House, 18.ix.71, in the Lee and Stort Navigations, locally common, *BSN* (58); Rye Meads (small lagoon SL), 2.xi.68, a single specimen; (SL/Wks), 20.x.68, slow stream, frequent to locally abundant; (SL East Channel), 15.viii.71, in effluent ditch, frequent; (SL 10), 4.x.64 effluent lagoon, a single specimen under marginal vegetation; (SL 10 N.E. corner), 19.iv.69, common; (SNL 8 & 9), 2.xi.68, effluent lagoons, fairly common; (NL 1 ditch), 21.iv.68, in weedy effluent channel, fairly common; (ditch NL 1/S.E.), 19.iv.69, common; (NL 4), 27.ix.64, effluent lagoon, common where marginal vegetation overhangs, and 31.vii.65, near sedges; (NL 5), 31.vii.65, in effluent lagoon, present; (NL 9), 21.x.67 (1♂ 2♀♀), in lagoons; 19.vi, 71, in effluent lagoon, fairly common; 24.vii.71, very common in 5 cm of silt in drying-up shallow lagoon; (NL/M), 20.x.62 ♂ & ♀, in dyke in *Callitriche;* (N. Meadows Pond), 11.xii.71, deep pool, fairly common mainly on the N. side steeper bank, and 18.iii.72, locally frequent; (S. of railway, in effluent stream), 8.xi.64, fairly common, and 31.x.71, very common; (S. of railway in River Stort Navigation), 20.vii.68 ♀, and 31.i.71, common; (pool adjacent to Old/New Gravel pit), 16.v.71 ♂, in gravel pit pool (flow), and 27.xii.71, a single specimen in rich gravel pit pool; (Gravel Pit), 26.vi.65, fairly common in gravel workings; 16.iv.67, present; 25.vii.70, common in old gravel pit on submerged 'cliffs' and pool with dense *Elodea;* 11.x.64, in gravel working, very common; (E. Gravel Pit), 11.x.70, in newly flooded gravel pit, common, (Gravel Pit W. Pool), 25.iii.72, in rich gravel pit pool, locally frequent to common; (Gravel Pit temporary pool), 11.x.64, a single specimen from peat pool; (S.W. Corner Gravel Pit), 19.iv.69, locally very common; (stream by house), 19.iv.69 ♀; (dyke meads), 11.x.64, present in dyke; (Tollhouse stream), 6.ii.71, in slow stream, fairly common at edge of *Carex;* all the above Rye Meads records are of *BSN* (58); Broxbourne Gravel Pits, 10.iv.47, in pond in gravel pit, *ESB* (HD); Broxbourne Meads, W. gravel pit, 10.v.62 ♀, in gravel working (this corixid specimen had two red mites, side by side, under its wings), *BSN* (58); Potter's Bar Park, 22.x.70, in Upper Lake, locally frequent, *BSN* (58); near Hoddesdon, 6.viii.40 (11♂♂ 12♀♀) in River Lea halfway between Hoddesdon and Rye House, *ESB* (67a); River Lea, 6.viii.40 (1♂ 2♀♀), below the weir just east of Hoddesdon, *ESB* (67a); Gt Amwell, 23.iii.40, in pond in orchard, *ESB* (HD); Gt Amwell, 28.iii.40, in ditch by the River Lea, *ESB* (HD); Haileybury, 11.iv.40 ♂ & ♀, in pond in the Master's garden, *ESB* (HD); Little Amwell, 5.iv.40, in small pond (12 ft × 16 ft and 1-2 ft deep) in an open field near Hertford Heath, a single specimen, *ESB* (67a) (HD); Brickenden Liberty (Ettridge Farm), 1.v.71, in farm pond, fairly common in green water, *BSN* (58); just on the boundary at Lemsford Springs, 22.viii.71, in watercresss beds, frequent, *BSN* (58); and beyond at Wheathampstead, vii-ix 59 (20 examples) and 23.vi.59 (one example) taken in MV light trap situated in a small orchard of fruit trees, *IFL* (33h); and Harpenden (Rothamsted Expt. Station grounds) 7.viii.53, taken in light trap, *DCT* (12) (59); 15.viii.47 ♀, 6.viii.50 (62♂♂ 46♀♀), 7.viii.50 (2♀♀) and 31.viii.50 ♂, all taken in MV light trap, *ESB* (84).

Essex. Chingford, 20.xii.12, *EAB* (BM); Epping Forest, n.d. [prior to 1923], ponds near the 'Robin Hood', *CN* (35a); 15.iii.53, pond in Fairmead Bottom, *IFL* (86); Waltham Abbey (Cornmill Stream), 22.x.70, rich dyke, frequent, *BSN* (58); Epping (Epping Green), 25.ix.64, in flooded ditch (1♂) and in pond in ditch (1♀), *BSN* (58); (Lindsey Street), 25.ix.64 ♂ & ♀, in village pond, *BSN* (58); Roydon Meads (R. Stort), 22.viii.71, in fast river pool, *BSN* (58); Roydon (R. Stort feeder), 13.v.62 ♀, *BSN* (58); Rye Meads (Stort Navigation), 9.v.63 ♀, 18.v.63 ♀, 26.vii.65, and 15.x.67 (several in 2-3 ft of water), *BSN* (58); Parndon Mill, 6.x.64, in dyke, frequent, *BSN* (58); 15.x.64, in River Stort, abundant, co-dominant with *Sigara dorsalis,* and in overflow ditch, frequent, *BSN* (58); Burnt Mill (Stort Navigation), 15.viii.71, in canal, fairly common, *BSN* (58); on boundary at Pishiobury Park, 26.x.64, in River Stort, common with *Sigara dorsalis, BSN* (58); and Harlow (Rivetts Farm, Rye Hill), 27.x.64 ♀, field pond, *BSN* (58).

Kent. Lee, *JS* (BM); *WW* (4) (39) 22); Hither Green Lane, *WW* (39); Ruxley Gravel Pit, 15.xii.62, *KCS* (14) (MM); and beyond the boundary on the Higham Marshes, 2.v.65, *AMM* (1/**1965,** 57) (22); 28.ix.46, in dykes, common, *AMM* (BM).

Surrey. Richmond Park (Pen Ponds), 1934-38, *EJP* (68b); 21.iii.54 ♀, in small pond (SR 18) 200 yards from the N.W. shore of the Upper Pen Pond, *EJP* (31i); 21.iii.54 (2♂♂) in small pond (SR 19) 100 yards N.E. of Ham Gate, *EJP* (31i); 21.iii.54 (4♂♂ 2♀♀), an open pond (SR 20) quite close to the Ham Gate, *EJP* (31i); Richmond, *GCC* (BM); Wimbledon Common, 12.x.52, *DJC & JABo* (BM); 23.viii.46, in Kingsmere, *EJP* (68b); 23.viii.46, in a small stream draining Kingsmere towards Roehampton, *EJP* (68b); 23.viii.46, open pond (SR3) on S. side of the Portsmouth Road, ½ mile S.E. of Roehampton, *EJP* (68b); Putney Heath, 24.viii.46, a small horse pond (SR 14) near the Putney-Wimbledon road and about ¼ mile from Tibbets Corner, *EJP* (68b); Banstead, 1.vii.52 ♂, 20.vii.52 (2♂♂ 3♀♀), 21.vii.52 ♀, 25.vii.52 (3♂♂ 3♀♀), 26.vii.52 ♂, and 2.viii.52 (6♂♂ 7♀♀), at MV light,

*AEG* (76) (1/**1952-53,** 12); 25.v.53 (2♀♀), 23.vi.53 ♂, 4.vii.53 ♂, at MV light *AEB* (EMM **90,** 166); Burgh Heath, 18.vii.70, in shallow sandy pool, *BSN* (58); Waltham [Mere Pond], 18.vii.70, roadside gravel pond, fairly common, *BSN* (58); Epsom Common, 6.iv.66♀, temporary pond 1-2ft. deep, among grass, *BSN* (58); (Stew Pond), 6.iv.66 (1♂ 1♀), 29.iv.66 (frequent) and 24.v.70 (fairly common), *BSN* (58); Bookham Common, 29.ix.51, in IOW pond, *DL* (34); Esher Common, 1922-25, in deep temporary pools colonized by *Juncus bulbosus, OWR* (61); 23.x.51, in bomb hole by Black Pond, *FJC* (69)(SL); and on the boundary at Byfleet, 24.iv.17, *EAB* (BM); *FJC* (SL); and beyond at Chobham Common, vi.1876, *ES* (HD); Horsell Common, 6.vi.31 ♂, and 16.ix.31 ♀, *FJC* (SL); Woking, *GCC* (BM); Basingstoke Canal between Pirbright Bridge and Frimley Green, 1954-55, *HDS* (50); Thursley Common, 12.vi.73, in Hammer Pond, *RRF* (66); and Ockley, 11.vii.72, in Vann Lake, *RRF* (66).

Bucks. Beyond the boundary at Sheepcote, near Aylesbury, 13.iv.40 ♀, *ESB* (HD).

*Sigara (Subsigara) distincta* Fieb. Sp. 501 p.392

D & S p.608 (*Corixa distincta*) and p.612 (*C. douglasi* sensu D. & S.)
S p.587 (*C.distincta*)
B p.587 (Sp. 444, *C. distincta*)

Common. Found in detritus ponds (particularly those on clay) and usually amongst or near emergent vegetation around the margins. Often found in association with *S. dorsalis*. *S. distincta* has a similar pattern of life-history to that of the previous species, probably with two generations a year. It has been taken on several occasions at light in a MV lamp trap. Bucks. records required.

Middx. Hampstead Heath, 16.viii.49, pond on the Heath, *DL* (31a); Enfield (Wrotham Park), 22.ii.53 (2♀♀), 19.iv.53 (2♂♂ 4♀♀), 4.v.53 (4♂♂ 14♀♀); 13.v.53 (6♂♂ 9♀♀), 11.x.53 (2♂♂) and 22.xi.53 (11♂♂ 20♀♀), in large cattle pond with thick layer of silty detritus in marginal areas, pH usually about 7, *IFL* (71); South Mimms (Dyrham Park), 18.i.53 (6♂♂ 2♀♀), 19.iv.53 (1♂ 3♀♀), 17.v.53 ♂ & ♀, 11.x.53 (3♂♂ 2♀♀) and 29.xi.53 ♂, in large pond with detritus covered bottom, *IFL* (71); Stanmore ponds, 14.x.70, sandy ponds, frequent, *BSN* (58); Ruislip LNR, 1963-64, rare in the Reserve with only one certain record having been made in the Front Pool in late September (30.ix.64 ♂), *WFS* (49).

Herts. Barnet (Hadley Green), in a moderately large pond with a fine gravelly bottom and silty detritus, pH 4.5-7, Locus A, 27.i.53 ♂, 9.iii.53 (11♂♂ 13♀♀), 25.iv.53 ♀, 6.v.53 (2♂♂ 2♀♀), 25.viii.53 (1♂ 2♀♀), 25.ix.53 (2♂♂ 2♀♀), 29.x.53 (2♂♂ 1♀) and 15.xi.53 (1♂ 3♀♀), Locus B, 29.x.53 (9♂♂ 5♀♀), 15.xi.(7♂♂ 5♀♀) and 13.xii.53 (1♂ 2♀♀), Locus C, 25.viii.53 ♂, 29.x.53 ♀, and 15.xi.53 ♂ & ♀, and Locus E, 25.ix.53 (28♂ ♂ 21♀♀); in slightly larger pond than the previous, with much detritus, 22.xi.53 ♂ & ♀; and in a small circular pond, 6.v.53 ♀ — all records of *IFL* (71); Totteridge, 19.ix.37, pond by roadside, *GAW* (67b); 1 mile S. of Rickmansworth, 16.i.77, in small weedy pool, 2-3 ft deep and fouled by sheep, *PAN* (78); Stansborough Lakes N., 1.xi.70, in river-fed lake, frequent, *BSN* (58); Tyttenhanger Gravel Pit, 19.xii.71 ♀, in gravel pit pool, *BSN* (58); near Hatfield 26.iv.59 (2♂♂ 7♀♀) in field pond N.W. of Astwick Manor, *IFL* (33h); Rye Meads (SL/Wks), 20.x.68 ♂, in slow stream, BSN (58); (SL 10), 4.x.64 ♀, in effluent lagoon, *BSN* (58); (N. Meadow Pond), in deep pool, 11.x.71, a single ♂, and 18.iii.72, frequent, *BSN* (58); (Gravel Pit), 26.vi.65, only one found after extensive search, *BSN* (58); (River Stort), 30.vi.65 ♂, *BSN* (58); (Tollhouse Stream), 18.x.70 and 24.vii.71 ♀, in shaded dyke behind Hut, *BSN* (58); Broxbourne, 1.v.62 (3♀ ♀), in the Lee Navigation, *BSN* (58); Broxbourne Gravel Pit, 18.x.70, fairly common in pool 1.5 m deep of clear water on gravelly clay, rich submarine vegetation, *BSN* (58); Hoddesdon (Barclay Park), 17.iv.62 ♂, in lake, *BSN* (58); Bayford, 25.iv.62, in village pond, *BSN* (58); Jenningsbury Moat, 1 mile S. of Hertford, 23.v.40 ♂ & ♀, in a 20-yard stretch of water with black mud and no vegetation, *ESB* (67a) (HD); and beyond the boundary at Waterford, 29.x.64, in gravel workings, frequent, *BSN* (58); Wheathampstead, 16.viii.59 (one example) and 24.viii.59 (two examples) taken in MV light trap situated in a small orchard of fruit trees, *IFL* (33h); and Harpenden (Rothamsted Expt. Station grounds), 26.vii.49 ♂, 6.viii.49, ♀, 7.viii.49 ♀, taken in MV light trap, *ESB* (84).

Essex. Epping Forest, n.d. [prior to 1923], ponds near the 'Robin Hood', *CN* (35a); (Golding's Hill ponds), 2.vii.40 (13♂♂ 23♀♀), in the lower of the two ponds, *ESB* (67a); 2♂♂ 2♀♀, *ESB* (HD); (Loughton), 22.x.64, in ponds, very common, *T. Lloyd-Evans* per *BSN* (58); Epping (Epping Plain Lake), 25.ix.64 (4♂♂ 1♀), from lake, *BSN* (58); Epping Green, 25.ix.64 ♀, in farm pond, *BSN* (58); Little Parndon (Parndon Mill), on the River

Stort, 15.x.64 ♂, *BSN* (58); and Potter Street (Harlow Common), 30.x.64 ♀, in clay pond, *BSN* (58).

KENT. Blackheath, *AAA* (22); Lewisham, in the River Ravensbourne in October, *D & S* (28) (4) (36) (22); Lee *JS* (BM); 16.x.1897, pond in Hither Green Lane, *WW* (60) (4) (39) (22); Ruxley Gravel Pit, 15.xii.62, *KCS* (22) (MM); and beyond the boundary at Higham Marshes, 2.v.65, *AMM* (1/**1965**, 57).

SURREY. Richmond Park, 21.iii.54 (3♀♀) in small pond (SR 18), 200 yards from the N.W. shore of the Upper Pen Pond, *DL* (31i); 1934-38, Pen Ponds, *EJP* (68b); 27.viii.46, in open pond (SR 20) quite close to Ham Gate, *EJP* (68b); 21.iii.54 (1♂ 4♀♀), *DL* (31i); Wimbledon *GWK* (3); Wimbledon Common, 23.viii.46, in open pond (SR3) on S. side of the Portsmouth Road, ½ mile S.E. of Roehampton, *EJP* (68b); 23.iii.54 (3♂♂ 6♀♀), *DL* (31i); 23.viii.46, in Kingsmere, *EJP* (68b); 23.iii.54 (1♂ 6♀♀), in Queensmere, *DL* (31i); Banstead, 21.vii.52 ♂ & ♀, 25.viii.52 ♂, 26.vii.52 (2♂♂ 2♀♀), 1.viii.52 ♀, and 4.viii.52 (4♂♂ 4♀♀), at MV light trap, *AEG* (76) (1/**1952-53**, 32); Reigate, n.d., ♀, *JHB* in *ES* coll. (HD)(36) (37) (3); Walton-on-the-Hill, 24.vii.75, in the Mere, *RRF* (66); Headley, 7.v.74, in Young Pond in Nower Wood Nature Reserve, *RRF* (66); Bookham Common, 4.iv.31 and 15.viii.53, *FJC* (SL); 28.iv.51 and 29.ix.51, in IOW pond, *DL* (34) (54); 11.iv.54 in IOW pond, *EWG* (24); Esher Common, 23.iii.31, in small pond by the Black Pond, *FJC* (62) (SL) (1/**1931-32**, 49); Weybridge, *CWD* (37) (3); and on the boundary at Byfleet, 24.iv.17, *EAB* (BM); *EAB* in *EAN* coll. (C); and beyond at Chobham Common, *ES* (37) (3); Horsell Common, 6.vi.31, *FJC* (SL); Woking, *GCC* (BM); Thursley Common, 17.vi.75, in Whitbread Pond, *RRF* (66); Chiddingfold, 1898, *HStJKD* (HD); and Elstead Common, 19.vii.53, *LC* (64).

*Sigara (Vermicorixa) lateralis* Leach Sp. 502 p.393
D & S p.598 (*Corixa hieroglyphica*)
S p.334 (*C. hieroglyphica*)
B p.580 (Sp. 437, *C. hieroglyphica*)

Common and widespread. Occurs in ponds and ditches fouled by cattle or slurry draining into them from farm buildings and their surroundings. It is often the species, along with *Hesperocorixa sahlbergi* that is found colonizing cattle troughs placed in open fields. Eggs are laid by the overwintering females during March and April, the development of the larvae (females take longer than the males) taking about 6-7 weeks. A further generation, possibly two in favourable years, may occur. Bucks. records required.

MIDDX. Hampstead, ix.-xi.48, in pond on the Heath, *JDH* per *DL* (31a); Enfield (Wrotham Park), 22.ii.53 (11♂♂ 10♀♀), 8.iii.53 ♂, 19.iv.53 (5♂♂ 4♀♀), 4.v.53 (10♂♂ 10♀♀), 13.v.53 (8♂♂ 7♀♀), 20.ix.53 (8♂♂ 6♀♀), 22.xi.53 (4♂♂ 6♀♀), and 13.xii.53 (10♂♂ 15♀♀), in large cattle pond, gravel bottom covered with thick layer of detritus, pH usually about 7, *IFL* (71); 23.ii.53, 19.iv.53 and 11.x.53, *IFL* (86); South Mimms (Dyrham Park), 22.iii.53 (2♂♂ 1♀) and 19.iv.53 (1♂ 3♀♀), in large pond with bottom covered with detritus, open to cattle at eastern end, pH 7, *IFL* (71); 22.iii.53, Loc. II, *IFL* (86) (BM); 19.iv.53, *IFL* (86); (Mimms Wash Stream), 29.iii.53 ♀, *IFL* (71) (BM); Ruislip LNR, 1963-64, rare in the Reserve with only 2 ♀♀ having been taken at the E. corner of the Main Pool in November (9.xi.63 *WFS*) (49); Hanwell, 15.x.06, *AJC* (HD).

HERTS. Whetstone, 1.viii.60 ♂, taken in MV light trap, *PHW* (pers. comm.) (47); Barnet (Hadley Green), Locus A. — 6.v.53 ♂, 15.xi.53 (1♂ 2♀♀), and 13.xii.53 (1♂ 2♀♀) in moderately large pond, pH variable between 4.5 — 7, in the shallow area on the southern side, fine gravelly bottom with silty detritus and no submerged vegetation, and at Locus C.— 29.x.53 (3♂♂) in shallow area on the northern side with submerged vegetation, *IFL* (71); 13.x.49, *IFL* (BM) (86); 6.v.53, in Pond A, *IFL* (BM); 6.v.53, in Pond C, *IFL* (86); 26.iii.53, in Pond D, *IFL* (BM); Monken Hadley (Hadley Common), 22.ii.53 ♀, 26.iii.53 ♂, and 22.xi.53 (2♀♀) in small circular pond with bottom of silty detritus, branches and dead leaves, pH usually about 7, *IFL* (71); Totteridge, 19.ix.37, in pool by roadside, *GAW* (67b); (Darland's Lake), 30.iv.83, *JB* (85); Elstree, 8.vii.45, *CHA* (17); Broad Colney, 21.i.51, in gravel pit, *IFL* (86); London Colney, 25.ii.59 (6♂♂ 14♀♀), in gravel pit, *IFL* (33h); St Albans (River Ver), 27.ix.53, *IFL* (BM); near Hatfield, 20.iii.59 ♂, in field pond (Pond A) S. of Symondshyde Great Wood, *IFL* (33h); 26.iv.59 (41♂♂ 35♀♀) in field pond (Pond D) N.W. of Astwick Manor, *IFL* (33h); Rye Meads (NL), 18.viii.60, two specimens in effluent lagoon, 28.x.61 ♂, in stagnant pool by Hut, and 24.ii.62 ♂ & ♀, in running ditch by Hut; (NL 4), 11.viii.61, twenty specimens collected in small lagoon; (NL 9), 2.iv.66 ♂; (SL) 23.ix.61 (6♂♂ 5♀♀), in temporary pool, 6 inches deep on silt; (SL 14/16), 30.ix.61 ♂,

in effluent lagoon; (S. Rough), 12.viii.62 ♂ & ♀, among 12 corixids in temporary pool; (Gravel Pit) 26.vi.65, two examples found after extensive search; and (Works) 28.viii.66, in temporary pool, common; all the above records are of *BSN* (58); Broxbourne (Monk's Green), 14.iv.62 ♂, in field pond, *BSN* (58); Haileybury (Rounding's Pond), 19.ii.39, 12.xi.39, 9.xii.39, 4.iv.40, 9.iv.40, 26.iv.40 and 9.vi.40 ♀, *ESB* (HD); 5.iv.40, in small pond 12 ft × 16 ft and 1-2 ft deep (HT5) in an open field near Hertford Heath, *ESB* (67a) (HD); near Hertford Heath, 5.iv.40, in an artificial pond (HT 7) in Golding's Wood, *ESB* (67a); 23.iii.38, *ESB* (HD); near Jenningsbury, 10.iv.40 (2♀♀), pond (HT 11) by the Hertford-Hoddesdon road, *ESB* (67a) (HD); Jenningsbury Moat, 16.iv.40, several specimens in stretch 20 yards long with black mud and devoid of vegetation, *ESB* (67a); 16.vi.40 (2♂♂), 23.v.40 (all ♀♀) and 3.viii.40, *ESB* (HD); and just on the boundary at Symondshyde, 22.ii.59, in Ponds A & D, *IFL* (86); Hunsden (Lord's Wood pond), 26.xi.64, fairly common, *BSN* (58); and beyond at Wheathampstead, vii.-ix.59 (138 examples) and 13.ix.60 ♀, taken in MV light trap situated in a small orchard of fruit trees, *IFL* (33h) and Harpenden (Rothampsted Expt. Station grounds), 5.viii.35, to light trap, *DCT* (12) (59); 6.viii.50 (6♂♂ 8♀♀), 7.vii.50 ♀, 21.vii.50 ♂, in MV light trap, *ESb* (84).

Essex. Walthamstow marshes, 25.ix.83, in bomb hole, *JB* (86); Epping Forest (Fairmead Bottom), in bomb crater ponds — Pond A. (15-20 ft. diam., with depth *circa* 5 ft), 23.iii.52 ♂ & ♀, *IFL* (33f); 13.iv.52 (in bomb crater 3 & 4) and 29.ix.52 (in bomb crater 4), *IFL* (BM); 15.iii.53, in pond, *IFL* (BM) (86); (Earl's Path pond), 15.iii.53, *IFL* (BM); (Loughton) iv.09 ♂, *EAN* (C); 30.iii.12, *EAB* (BM); 22.x.64, in ponds, locally common, *T. Lloyd-Evans* per *BSN* (58); Epping (Lindsey Street), 29.ix.64 ♀, in village pond, *BSN* (58); Epping Upland (Chamber's Manor), 29.ix.64 ♂, in cattle pond, *BSN* (58); Epping Green, 29.ix.64 (2♂♂ 12♀♀), in duck pond, *BSN* (58); Epping Long Green, 29.ix.64, in farm pond (6♂♂ 15♀♀) and in ditch pond (3♀♀), *BSN* (58); Rye Hill, N.W. of Epping Upland, in field pond at Rivetts Farm 27.x.64 (1♂ 2♀♀) and 30.x.64 (fairly common), *BSN* (58); Potter Street (Harlow Common), 30.x.64, in clay pond, frequent, *BSN* (58) and Netteswell lake, 27.x.64, two examples from this small lake, *BSN* (58).

Kent. Greenwich Park, n.d. [1970s-1980s], in Long Pond, occasional, *AAA* (51) Blackheath in two similar ponds on the Heath, 27.xi.57 (several examples) and 16.v.67 (one example), and very common of later years [i.e. 1970s-1980s] in the Round Pond, *AAA* (51); Lee, 9.x.1895, in field pond, Hither Green Lane, *WW* (60) (39) (4); Catford, 18.ix.01, in the River Ravensbourne, *WW* (60) (39) (4) (22); Dartford Marshes, 19.vii.58, ex. dyke, *IFL* (BM); Gravesend, *JAP* (BM); *GCC* (BM); and beyond the boundary at Higham Marshes, 28.ix.46, in dykes, not common, *AMM* (BM) (22).

Surrey. Richmond Park, 19.ix.37, in pond (SR 1) with stream flowing through it, *GAW* (67b); 21.iii.54, in small pond (SR 19) 100 yards N.E. of Ham Gate, *DL* (31i); Wimbledon Common, 12.x.52, 21.x.52 and 9.xii.51, *DJC & JABo* (BM); 16.xii.51, *DJC & JABo* in *IFL* coll. (86); 23.viii.54, in Kingsmere (12♂♂ 11♀♀), and in Queensmere (a single ♂), *DL* (31i); Banstead, 19.vii.52 (3♂♂ 5♀♀), 20.vii.52 ♂, 21.vii.52 ♀, 25.vii.52 (4♂♂), 26.vii.52 (9♂♂ 8♀♀), 29.vii.52 ♀, 2.viii.52 (17♂♂ 15♀♀), at MV lamp, *AEG* (76); 5.v.53 ♂, 23.vi.53 and 4.vii.53 ♂, at MV lamp, *AEG* (EMM **90**, 166, 1954); Coulsdon, vii.33, *ECB* (NM); Colley Hill, 13.v.50, *DL* in *IFL* coll. (86); Walton-on-the-Hill, 18.vii.70, in roadside gravel pond [= Mere Pond], *BSN* (58); Epsom Common, 6.iv.66, in Stew Pond (a single ♀) and in a temporary grassy pond (1♂ & 1♀), *BSN* (58); Bookham Common, 28.iv.51, in IOW pond, *DL* (34); Oxshott Heath, 26.iii.05, *AJC* (HD); Esher, 31.v.1888, in pond by roadside near 'The Swan', *EAN* (C); Esher Common, 1922-25, in Black Pond and in temporary pools colonized by *Juncus bulbosus, OWR* (61); 15.x.51 ♂ & ♀, 23.ix.51 ♂,and 29.x.51 ♂, taken in bomb hole by Black Pond, *FJC* (62) (SL); and beyond the boundary at Chobham Common, 4.x.36, *ECB* (NM); Horsell Common, 16.ix.32 ♀, *FJC* (SL); and Gomshall, viii.1899, *EAB* (BM).

Bucks. Beyond the boundary at Cholesbury, Chiltern Hills, 11.viii.15, *EAB* (BM); 10.xii.71, in village pond, frequent in bare shallows, *BSN* (58).

*Sigara (Vermicorixa) nigrolineata* (Fieb.) Sp. 503 p.393
D & S p.605 (*Corixa nigrolineata*)
S p.337 (*C. fabricii*)
B p.592 (Sp. 450, *C. nigrolineata*) and p.590 (Sp. 448, *C. saundersi*)

Common. Like the last species, *S. nigrolineata* is also an inhabitant of silted and often befouled ponds. Overwintered females lay eggs in late April and May and the adults of this first generation have been found in July. A second generation follows soon afterwards reaching maturity from October to November. It is a

species very variable in colour with both dark and light forms often occurring together. Migration readily occurs (*fide* Popham, source 68b, p. 169), either when the population becomes overcrowded or when a too rapid an evaporation of water take place during a hot summer and the ponds begin to dry out. Some specimens (1♂ & 3♀♀) taken on Chobham Common, Surrey and described by G. W. Kirkaldy (EMM **35,** 2, 1899) as a new species *Corixa saundersi* would seem to be only a small form of *S. nigrolineata.* Bucks. records required.

MIDDX. Hampstead Heath, 3.viii.50 and 13.i.51, in Viaduct Pond, *DL* in *IFL* coll. (86); Finchley, 18.iv.43, *CHA* (17); Enfield (Wrotham Park), 4.v.53 (2♂♂ 1♀) and 11.x.53 ♀, in large cattle pond with thick layer of silty detritus in some marginal areas, pH usually about 7, *IFL* (71); South Mimms (Dyrham Park), 11.x.53 ♂, *IFL* (71); (Mimms Wash Stream), 29.iii.53 (3♀♀), 11.x.53 ♂ & ♀, 29.xi.53 (2♂♂ 2♀♀); 15.v.52 and 29.iii.53, *IFL* (71); 15.v.52 and 29.iii.53, *IFL* (86); Hendon, 1.xi.02, *ECB* (NM); Ruislip LNR, so far appears confined to the New Pool dug during the winter of 1963-64, and recorded in March (6♂♂, 30.iii.64) becoming occasional in August (9.viii.64) but abundant by late September (30.ix.64) — all records of *WFS* (49); and Hanwell, 14.x.05, *AJC* (HD).

HERTS. Whetstone, 18.vii.59, in MV light trap, *PHW* (BM); Barnet (Hadley Green), 25.ix.53, ex. pond, *IFL* (BM); 19.iv.49 and 24.iv.49, *IFL* (BM); 27.i.53, 22.ii.53, 9.iii.53 and 6.xii.53, in pond A, *IFL* (86); 19.iv.49, 30.x.49, 29.iii.50 and 8.v.50, *IFL* (86); 5.ix.51, in open habitat, pH 4.5, and in closed habitat, pH 7.3, *IFL* (86) (BM); 19.xii.71, in S.W. Pond, frequent, *BSN* (58); in moderately large pond, pH variably 4.5-7, Locus A, 27.i.53 (13♂♂ 6♀♀), 22.ii.53 (7♂♂ 10♀♀), 9.iii.53 (20♂♂ 21♀♀), 26.iv.53 (9♂♂ 42♀♀), 6.v.53 (5♂♂ 27♀♀), 25.viii.53 (1♂ 4♀♀), 25.ix.53 (3♂♂ 17♀♀), 29.x.53 (21♂♂ 32♀♀), and 15.xi.53 (34♂♂ 36♀♀); Locus B, 29.x.53 (3♀♀), 15.xi.53 (3♂♂ 4♀♀) and 13.xii.53 ♂; Locus C, 29.x.53 (5♀♀) and 13.xii.53 ♀; and Locus F, 25.ix.53 (7♂♂ 13♀♀) and 15.xi.53 (4♂♂ 15♀♀) — all records of *IFL* (71); 30.x.70 ♂ & ♀, in W.Pond, *BSN* (58); Totteridge (Darland's Lake), 30.iv.83, *JB* (85); Rickmansworth, 26.viii.16, *EAB* (BM) (11) (12); Tyttenhanger Gravel Pit, 19.xii.71, in pool, fairly common, *BSN* (58); London Colney (Smallford), 5.x.64, in River Colne, frequent, *BSN* (58); St. Albans (Oaklands), 17.xii.71, in sandy gravel pit pool, very common, *BSN* (58); between Brookman's Park and Water End, 24.xii.71, in field pond, locally frequent to common, *BSN* (58); Sandridge gravel pit, 22.ii.59, ♂, W. of Symondshyde, *IFL* (33h); near Hatfield (Park Gate Gravel pits), 4.v.52, *IFL* (BM); Essendon (Wildhill) 1.v.71, in shallow field pond, frequent, *BSN* (58); Rye Meads (NL), 22.x.61 (10♂♂ 12♀♀) in running ditch; (NL/Lee Marsh), 20.x.62 (3♀), in *Callitriche* in deep ditch; (NL Hut), 4.xi.62 (6♂♂ 3♀♀), in muddy pool; (NL 5), 31.vii.65, a single specimen in effluent lagoon; (SL), 14.iv.62 (8♂♂ 7♀♀), in ditch, very common; (small SL), 2.xi.68, in effluent lagoon, frequent; (SR), 12.viii.62 (2♂♂ 4♀♀ and immatures) in temporary pool; (Meads), 28.x.61 (2♂♂ 2♀♀) and 18.x.62 ♀, in cattle trough; 28.x.61(1♂ 2♀♀) in dyke, and 11.x.64, in old pond — all the above Rye Meads records of *BSN* (58); Broxbourne Meads, 10.v.62 ♀, in gravel pit, *BSN* (58); (Lodge Hollow), 29.x.61 ♂ & ♀, in temporary pool in gravel workings, *BSN* (58); Broxbournebury Gravel Pit, 18.x.70, common in one of six small pools, *BSN* (58); Wormley (Beaumont Manor), 5.x.64, in trough, common, *BSN* (58); Hoddesdon (High Leigh), 15.vii.65, in temporary pools in gravel workings, common to abundant, *BSN* (58); Hertingfordbury, in gravel pits one mile S.W. of Cole Green, 4.viii.50 ♀, in pool on N.W. side of the Hertford-Hatfield road, *ESB* (HD) (67a); 4.viii.50 (4♂♂ 2♀♀) in pond on S.E. side of the road, *ESB* (67a); Haileybury College, 11.iv.40 (2♂♂ 2♀♀), in pond in the Master's garden, *ESB* (HD); 9.iv.40 ♀, in sunken brick pond in the College vegetable garden, *ESB* (HD) (67a); 9.ii.39, pond in the Roundings, *ESB* (HD); Golding's Wood, near Hertford Heath, 7.x.40 (9♂♂ 7♀♀), in an artificial pond (HT 7) made about 1937, *ESB* (67a)(HD); 5.iv.49, *ESB* (HD); near Hertford Heath, 6.iv.40 (2♂♂ 2♀♀) and 29. v.40 (6♂♂ 14♀♀), in small pond (HT 6) near the Heath, *ESB* (67a) (HD); 23.vi.40, in small pond (HT 5) measuring 12×16 ft and 1-2 ft deep in an open field, *ESB* (67a); 3.viii.40 (4♂♂ 6♀♀), in stream (HT 9) of trickling water for the most part, *ESB* (67a); near Jenningsbury, 10.iv.40 (3♀♀), pond (HT 11) by the Hertford-Hoddesdon road, *ESB* (67a) (HD); Jenningsbury Moat, 23.v.40 (2♂♂ 1♀), in 20-yard stretch with black mud and devoid of vegetation, *ESB* (67a) (HD); Brickenden Liberty, 6.v.62 (2♀♀), in puddle in Roman Road, *BSN* (58); Brickenden (Etteridge Farm), 11.x.64, in trough, common and dominant, *BSN* (58); and just on the boundary at Symondshyde, 22.ii.59, in Ponds A & D, *IFL* (86); Lemsford Springs, 12.iii.72, in galvanized trough, common, *BSN* (58); 19.iii.72, in small peat pond, fairly common to common, mating, *BSN* (58) 9.iv.72, in peat pool, fairly common, *BSN* (58); and beyond at Wheathampstead, 23.vi.59, 6.vii.59, 8.vii.59, and 28.vii.59. One example on each date taken in MV light trap situated in a small orchard of fruit trees, *IFL*

(33h); and Harpenden (Rothamsted Expt. Station grounds), 6.viii.50 ♂, taken in MV light trap, *ESB* (84).

Essex. Walthamstow marshes, 25.ix.53, in a bomb hole, *JB* (85); Epping Forest, 25.iii.07, *EAB* (C); (Fairmead Bottom) — in bomb erater ponds, Pond A, 23.iii.52 (3♂♂), 10.iv.52 ♂ & ♀, 13.iv.52 (1♂ 2♀♀), Pond B, 23.iii.52 (3♀♀), Pond C, 23.ii.52 ♂, and 28.ix.52 ♀, all records of *IFL* (33f); 10.iv.52 and 13.iv.52 both from erater pond I [=A], *IFL* (BM); 15.iii.53, in bomb erater pond III [=C], *IFL* (86); 23.iii.52, in bomb erater pond I [=A], II [=B], and III [=C], pH 7.0, *IFL* (86); (Loughton), 7.vi.1888, in pond, *EAN* (C); Epping Bury, 22.x.64 ♂ & ♀, in trough, *T. Lloyd-Evans* per *BSN* (58); Epping Bury Farm, 25.ix.64 (5♂♂ 16♀♀), in cattle trough, *BSN* (58); Epping Upland (Cobbins Brook), 25.ix.64 (3♂♂ 5♀♀), *BSN* (58); (Chamber's Manor Farm), 25.ix.64 (2♂♂), in cattle pond, *BSN* (58); Epping Long Green, 25.ix.64, a single ♂ in farm pond but very common in ditch ponds, *BSN* (58); Nazeing, 7.iv.13, *CN* (35a); (Middle Street), 25.ix.64 ♀, in roadside pond, *BSN* (58); Parndon Hall, W. of Harlow, 19.x.62 ♀, *BSN* (58); Gt Parndon (Katherine's), 23.x.64, one example in Parndon Brook, *BSN* (58); Rye Hill, 27.x.64 and 30.x.64, in field pond at Rivett's Farm, abundant, *BSN* (58); Rye Hill, 27.x.64 and 30.x.64, in field pond at Rivett's Farm, abundant, *BSN* (58); Potter Street (Harlow Common, 30.x.64, in clay pond, common, *BSN* (58).

Kent. Blaekheath, in garden pond at 63 Blaekheath Park, 'noted from a few days after the pond was first made and filled (Oct. 1958) up to the present time, but in varying numbers. Occurs throughout the year. Commonest in 1959-61 and thereafter gradually rarer; for several years past only seen singly or in small numbers. Nymphs noted as abundant resting on the bottom near edge of pond (24.v.59) and as abundant but maturing (24.vii.59). All stages apparently present on 11.ix.59. Never taken to light so far', *AAA* (51) (22); Greenwich, *WW* (39); Lee, *WW* (4) (39); Kidbrooke, *WW* (39); Orpington, 30.viii.49, *EG-S* in *IFL* coll. (86).

Surrey. Richmond Park, 19.ix.37, in pond with stream flowing through it, *GAW* (67b); 1934-38, in Pen Ponds, *EJP* (68b); 27.viii.46, in small pond (SR 18) 200 yards from the N.W. shore of the Upper Pen Pond, *EJP* (68b), 27.viii.46, in small open pond (SR 19) 100 yards N.E. of Ham Gate, *EJP* (68b); 27.viii.46, in open pond (SR 20) quite close to Ham Gate, *EJP* (68b); 27.viii.46, in a large open pond (SR 22) situated on the S. side of road from Ham Gate to Richmond Gate, *EJP* (68b); 27.viii.46, in two small ponds (SR 23) on E. side of the previously mentioned pond (i.e. SR 22), *EJP* (68b); 6.i.52, in White Ash Pond *DJC & JABo* (BM); 21.iii.54 (2♂♂ 3♀♀), in small pond (SR 19) 100 yards N.E. of Ham Gate, *DL* (31i); Barnes, 1888, *FPP* (HD); Wimbledon Common, *JAP* (BM); *GCC* (BM); 21.v.1882, *EAN* (C); 16.xii.51 and 21.x.52, *DJC & JABo* (BM); 23.viii.46, in open pond (SR 3) on S. side of the Portsmouth Road, ½ mile S.E. of Roehampton, *EJP* (68b); 23.viii.46, in small pond (SR 6) 200 yards W. of Kingsmere on the S. side of the Portsmouth Road. *EJP* (68b); 24.viii.46, in Queensmere, with a bottom of mud over concrete, pH 6.5, *EJP* (68b); 24.viii.46, in large closed pond (SR 13) near the Putney-Wimbledon road, situated ½ mile from the Wimbledon end of Wimbledon Common, *EJP* (68b); 23.iii.54 (2♀♀) in same pond (SR 13), *DL* (31i); Putney Heath, 24.viii.54, in small horse pond (SR 14) near the Putney-Wimbledon road about ¼ mile from Tibbets Corner, *EJP* (68b); 24.viii.54, in small open ditch (SR 15) on the Heath 20 yards from the end of Putney Heath road, *EJP* (68b); Headley Heath, 6.iv.75, in small pond. N. of Brimmer Pond, *RRF* (66); Epsom Common, 6.iv.66, in Stew Pond, a single ♂, *BSN* (58); 6.iv.66, in temporary, grassy pond on eastern side of the Common, very common, *BSN* (58); Claygate, *JAP* (BM); Bookham Common, 28.iv.51, in IOW pond, *DL*(34); Esher, 31.v.1888, in pond by roadside near 'The Swan', *EAN* (C); Esher Common, *GCC* (BM); 1922-25, in three different habitats — in Blaek Pond, in temporary pools colonized by *Juncus bulbosus*, and in drainage ditches dug after tree felling, *OWR* (61, given throughout this souree as *Arctocorisa fabricii*); 23.iii.31, abundant within swamps by path near Blaek Pond, *FJC* (62); 23.iii.31 ♂ & ♀, *FJC* (SL) (1/**1931-32,** 49); 15.x.51 (2♂♂ 5♀♀), 23.x.51 (1♂ 7♀♀) and 29.x.51 (4♀♀), common in bomb hole near the Blaek Pond, *FJC* (62, with some of this material represented in SL); and beyond the boundary on Chobham Common, vi. 1876, *ES* (BM, **Type** of *C. saundersi* Kirkaldy) (HD) (EMM **35,** 2, 1899) (1/**1899,** (55) (3) (38); Horsell Common, 26.iii.32, *FJC* (SL); and Woking, *JAP* (BM).

Bucks. Beyond the boundary at Sheepcote near Aylesbury, 12.iv.40 and 13.iv.40 (2♂♂ 2♀♀), *ESB* (HD).

*Sigara (Vermicorixa) concinna* (Fieb.) Sp. 504 p.394
D & S p.604 (*Corixa concinna*)
S p.340 (*C. concinna*)
B p.596 (Sp. 455, *C. concinna*)

Occasional though at some, often quite small, habitats it may be common. This species occurs in ponds, small lakes, gravel pits with clay bottoms, and in slow flowing rivers having little or no weed. In Hertfordshire B. S. Nau found this species common in effluent lagoons of the sewage treatment works at Rye Meads. In Kent, outside the L.N.H.S. area, it has been recorded in brackish pools in the Thames estuary. This species would seem, therefore, to have a wide tolerance in habitat selection. On the basis of available records the life-history in southern Britain consists of two generations a year; the first reaching maturity by June and the second by late September. Bucks. records required.

MIDDX. Enfield (Wrotham Park), 11.x.53 ♀, *IFl* (71); South Mimms (Mimms Wash Stream), 21.iii.54 ♂, *IFL* (71).

HERTS. Whetstone, 1.vii.60 ♀ and 30.viii.60 ♀, taken in MV light trap *PHW (pers. comm.)* (47); near Hatfield, 26.iv.59 ♀, in field pond (Pond D) N.W. of Astwick Manor, *IFL* (33h); 29.iv.59, pond near Hatfield Aerodrome, a large series taken, *IFL* (EMM **95**, 143, 1959); Rye Meads (small SL), 2.xi.68, very abundant in effluent lagoons; (SL effluent stream), 17.x.70, two examples in watercress; (SL), 24.ix.61, frequent in effluent channel; 2.iv.66, common; (SL 10), 21.x.67 ♀; (SL 10/N.E. Corner), 19.iv.69, a single example in effluent lagoon; (SL 12), 10.iv.66, in effluent lagoon, very common in warm shallows on gravel; (SL 13), 4.x.64, in gravel and floating algae, common; (SL 14), 10.iv.66, in effluent lagoon; (SL 17), 4.iii.62, in effluent lagoon, many floating near pump draining the lagoon, but much of the lagoon iced over, bugs were alive and moved when taken out and held in the hand but in the water remained inert; (NL 1), 8.vii.61 (3♂♂ 7♀♀) in effluent lagoon; (NL 4), 31.vii.65, in effluent lagoon, a single example at edge of *Carex;* (NL 5), 31.vii.65, in clear water and gravel, a single adult but I instar larvae (this sp.?) were abundant; (NL 7) 24.ix.61, in effluent lagoon, 9♂♂ 20♀♀, taken in a random sample of catch of 100-200 individuals obtained in one circular 2-yard sweep, very abdundant on this day; 27.ix.64, in effluent lagoon, very common; 10.iv.66, in effluent lagoon, very common in warm shallows on gravel; (NL 8), in effluent lagoon, 20.x.67 (5♂♂ 2♀♀) and 18.x.70, fairly common; (NL 9), in effluent lagoon, 2.iv.66 (2♂♂) and 19.vi.71 (very common) mainly among *Polygonum amphibium;* (SL Channel), 7.viii.71, in effluent ditch, a single example among *Veronica beccabunga;* (SNL 8 & 9), 2.xi.68, effluent lagoon, frequent; (SR), 12.viii.62 (3♂♂ 1♀), in temporary pool in company with *S. nigrolineata, S. lateralis* and immature larvae; Rye Meads Gravel Pit, 13.iv.67, present; all the above Rye Meads records are of *BSN* (58); Broxbournebury, 18.x.70, a single specimen in small pool, *BSN* (58); Broxbourne Gravel Pit, 10.iv.67, in pool (39), *ESB* (HD); High Leigh, near Hoddesdon, 17.iii.42 (2♂♂ 2♀♀), in lake, *ESB* (HD); and beyond the boundary at Wheathampstead, vii-ix.59 (45 examples) and taken in MV light trap situated in a small orchard of fruit trees, 25.viii.59, *IFL* (86) (33h); and at Harpenden (Rothamsted Expt. Station grounds), 26.vii.47 ♂, 29.viii.49 (3♂♂ 2♀♀), 4.viii.50 (3♂♂ 3♀♀), 6.viii.50 (10 ♂♂ 4♀♀), 7.viii.50 (6♂♂ 6♀♀), all taken in MV light trap, *ESB* (84).

ESSEX. Nazeing (Nazeingwood Common), 11.v.62 (3♂♂ 12♀♀), in duck pond with fine gravel bottom, *BSN* (58).

KENT. Blackheath, 2.x.73, in the Round Pond, several examples (along with many *S. lateralis*) two of which were teneral and 3 nymphs which may have been this same species, not found there since, *AAA* (51); Lewisham, in the River Ravensbourne in October, *D & S* (28) (36) (4) (22); Lee, *JWD* (36) (37); Gravesend, *GCC* (BM) (37) (4) (22); and beyond the boundary at Higham Marshes, 2.v.65, *AMM* (1/**1965,** 57); and Cliffe Marshes, 14.iv.73. *TW* (1/**1974,** 112).

SURREY. Wimbledon Common, 23.iii.54 (2♂♂ 2♀♀), in Kingsmere, almost devoid of vegetation, *DL* (31); Banstead, 20.vii.52 ♂ and 2.viii.52 ♂, at MV light trap, *AEG* (76); Bookham Common, 28.iv.51, in IOW Pond, *DL* (34) (86); Esher Common, *ES* (36) (37); *GCC* (3); and beyond the boundary at Thursley Common, 22.vi.83, in Moat Pond, *JB* (85).

*Sigara (Retrocorixa) venusta* (D & S) Sp. 505 p.394
S p.337 (*Corixa venusta*)
B p.583 (Sp. 442, *C. venusta*)

Very rare. There have been only four published records for this species in the

London Area, all from Surrey. As the voucher specimens for these records no longer exist (as far as can be traced) and therefore cannot be checked, there must remain some doubt as to the original identity. Beyond the L.N.H.S. boundary, but also in Surrey, the species was recorded from Chobham Common just over a hundred years ago, but it has not been reported from there since. In Britain the species exhibits a disjunct distribution with no known records from the Midlands. It is, however, fairly common in Scotland, N. Wales and England north of Derbyshire, but much less so in the eastern counties and those few from which it is positively known from in the south. In lowland country it is a bug of stream and ditches, mostly slightly to strongly acid. Positive confirmation of the presence of *S. venusta* in the London Area is therefore highly desirable.

SURREY. Wimbledon Common, 23.iii.54 ♀, in open pond (SR 3) on S. side of the Portsmouth Road, ½ mile S.E. of Roehampton, *DL* (31i); 24.viii.46, in Queensmere with bottom of mud over concrete, pH 6.5, *EJP* (68b); 24.viii.46, in large closed pond (SR 13) near the Putney-Wimbledon road, situated ½ mile from Wimbledon end of Wimbledon Common, *EJP* (68b); Putney Heath, 24.viii.46, in small horse pond (SR 14) near the Putney-Wimbledon road and about ¼ mile from Tibbets Corner, *EJP* (68b); and beyond the boundary at Chobham Common, n.d. [but probably *circa* 1876], *ES* (37) (3).

*Sigara (Retrocorixa) semistriata* (Fieb.) Sp. 506 p.395
D & S p.602 (*Corixa semistriata*)
S p.337 (*C. semistriata*)
B p.583 (Sp. 441, *C. semistriata*)

Rare. This species is fairly common in Ireland, Scotland, N. Wales and the Lake District, but it is rare in the south. It is restricted to those ponds and small lakes that are lime deficient but have a high amount of organic matter in solution. Such habitats often have *Sphagnum* or water-weeds growing around their margins, and may be fouled by cattle. Little is known of its life-history except that the adults overwinter and that there is probably just the one generation during the year. Records from Middx., Herts., Essex and Bucks. are required.

KENT. Lee, *D & S* (37) (4) (22).
SURREY. Richmond Park, 27.viii.46, in two small ponds (SR 23) on the E. side of a large open pond (SR 22) S. of road from Ham Gate to Richmond Gate, *EJP* (68b); Esher Common, 1922-25, in deep temporary pools colonized by *Juncus bulbosus*, *OWR* (61); 15.x.51, 23.x.51 and 29.x.51, in bomb hole pond near Black Pond, *FJC* (62); Oxshott Common, n.d. [prior to 1926], *OWR* (EMM, **62,** 267, 1926); and beyond the boundary at Horsell Common, *FJC* (62).

*Sigara (Retrocorixa) limitata* (Fieb.) Sp. 507 p.395
S p.336 (*Corixa limitata*)
B p.582 (Sp. 440, *C. limitata*)

Widespread, but in only a few places has it been found to be common. This species occurs in ponds that are rich in organic material, mostly on the clay. Not much is known of its life-history except that it probably pairs in March with the resulting new generation becoming adult by late August. Lansbury (source 71, p.159), examining ponds on the borders of Middx/Herts. found that *S. limitata* was invariably found in shallow water free of vegetation and always with a gravelly bottom covered with a silty detritus. He states that these conditions seem important to the satisfactory breeding of this species in a habitat. Elsewhere (source 74) this same author refers to this characteristic condition as a 'pale substratum'. Bucks. records required.

MIDDX. Enfield (Wrotham Park), 8.v.53, a single ♀ only, *IFL* (71) (86); 22.ii.53, *IFL* (86); 22.v.71 (frequent) and 21.iv.72 (common), in large pasture pond, *BSN* (58); South Mimms (Mimms Wash Stream), 22.ii.53 (22♂♂ 3♀), 8.iii.53 (8♂♂ 2♀♀), 19.iv.53 (8♂♂ 20♀♀), 4.v.53 (6♂♂ 16♀♀), 13.v.53 (10♀♀), 22.ix.53 (33♂♂ 45♀♀), 11.x.53 (21♂♂ 18♀♀), 22.xi.53 (11♂♂ 20♀♀), and 13.xii.53 (9♂♂ 4♀♀), dominant in this habitat, *IFL* (71).

HERTS. Potter's Bar, 22.x.70, a single specimen in pasture pond, *BSN* (58); Barnet (Hadley Green, 19.xii.71, in S.W. pond, frequent, including 1♂), *BSN* (58); (Hadley

Green) in moderately large sized pond with open habitat and several ditches draining into it, pH variable from 4.5-7, this species was dominant in this pond, Locus A, 27.i.52 (2♂♂ 10♀♀), 22.ii.53 (14♂♂ 16♀♀), 9.iii.53 (66♂♂ 74♀♀), 26.iv.53 (13♂♂ 64♀♀), 6.v.53 (7♂♂ 56♀♀), 25.viii.53 (28 ♂♂ 61♀♀), 25.ix.53 (27♂♂ 34♀♀), 29.x.53 (14♂♂ 22♀♀), 15.xi.53 (30♂♂ 23♀♀) and 15.xii.53 (15♂♂ 8♀♀), Locus B, 29.x.53 (6♂♂ 5♀♀), 15.xi.53 (10♂♂ 18♀♀), and 15.xii.53 (4♂♂ 10♀♀), Locus C, 25.viii.53 (16♂♂ 24♀♀), 25.ix.53 (15♂♂ 18♀♀), 29.x.53 (23♂♂ 21♀♀), 15.xi.53 ♂, and 15.xii.53 (8♂♂ 8♀♀), Locus E, 25.ix.53 (2♂♂) and 29.x.53 (2♂♂), Locus F, 6.v.53 (5♂♂ 11♀♀) — all records of *IFL* (71); (Hadley Green) 29.x.53 ♂ & ♀, in a small circular pond with a bottom of dead elm leaves at one side and bare, coarse gravel over the rest, pH usually about 7, *IFL* (71); (Hadley Green), 9.iii.53, in Pond A, *IFL* (BM); 25.ix.53, ex. pond, *IFL* (BM); (Hadley Green), 27.i.53, 22.ii.53, 9.iii.53 and 6.xii.53, all in Pond A, *IFL* (86); 8.v.50, 5.ix.51 (open habitat, pH 4.5), and 5.ix.51 (closed habitat, pH 7.3), *IFL* (86); Monken Hadley (Hadley Common), 25.viii.53 ♂, 25.ix.53 (2♀♀) and 22.xi.53 ♂ & ♀, in small circular pond with a bottom of silty detritus, branches and dead leaves, and pH usually about 7, *IFL* (71) (31j); Rye Meads (N. Meadow Pond), 18.iii.72 (2♀♀), in deep pool, *BSN* (58); (small unusual lagoon), 2.xi.68, in standing water, *BSN* (58); Haileybury, 31.vii.40 ♂, in pond at Roman Road, *ESB* (HD); Haileybury, 29.vii.40 ♀, in Rounding's Pond, *ESB* (HD); near Hatfield, 26.iv.59 ♀, in field pond (Pond D) N.W. of Astwich Manor, *IFL* (33h); and over the boundary at Symondshyde, 5.iv.59, in Pond D, *IFL* (86); 10.x.71, frequent in rich pond, *BSN* (58); and at Wheathampstead, 25.vii.59 (4 examples) taken in MV light trap situated in a small orchard of fruit trees, *IFL* (33h).

Essex. Epping Forest (Fairmead Bottom), in bomb crater pond A [= 1], 23.iii.52 (2♂♂ 3♀♀), *IFL* (33f); 13.iv.52, *IFL* (86); (Earl's Path Pond), 15.iii.53, *IFL* (86); and Nazeing, 7.iv.13, *CN* (35a).

Kent. Lee, *JAP* (BM); *D & S* (37); 16.x.1897 and 30.x.1897, pond in field, Hither Green Lane, *WW* (60) (39); Grove Park, *WW* (39).

Surrey. Richmond Park, 27.viii.46, in an open pond (SR 20) quite close to Ham Gate, *EJP* (68b); 21.iii.54 ♀, in small pond (SR 18) 200 yards from the N.W. shore of the Upper Pen Pond, *DL* (31i); 21.iii.54 ♀, in small open pond (SR 19) 100 yards N.E. of Ham Gate, *DL* (31i); (White Ash Pond), 6.i.52, *DJC & JABo* in *IFL* coll. (86); Wimbledon Common, 24.viii.46, in Queensmere, *EJP* (68b); 24.viii.46, in large closed pond near the Putney-Wimbledon road situated ½ mile from the Wimbledon end of Wimbledon Common, *EJP* (68b); 16.xii.51, 21.x.52 and 18.i.53, *DJC & JABo* in *IFL* coll. (86); Shirley Common, 1.iv.1899, in pond in the wood, *WW* (60); Banstead, 10.viii.53 ♂, in MV light trap, *AEG* (EMM **90,** 166); Godstone, 21.ix.71, in small pond in the field north of the A25, *KCS* (14) (MM); Reigate, *ES* (37); 1898, *JAP* (C); Bookham Common, 28.iv.51, in IOW pond, *DL* (34); Esher Common, 1922-25, in deep temporary pools colonized by *Juncus bulbosus*, *OWR* (61); (Black Pond), 23.iii.31, *FJC* (1/**1931-32,** 49) (62); in bomb hole pool near Black Pond, 15.x.51 ♂ and 23.x.51 ♂, *FJC* (62) (SL); and beyond the boundary on Chobham Common, 26.iii.32, *FJC* (SL); and Horsell Common, *JAP* (BM); 6.vi.31, *FJC* (SL).

Bucks. Beyond the boundary at Cholesbury, 10.ix.71, in rich village pond, frequent, *BSN* (58); and at Sheepcote, near Aylesbury, 12.iv.40 (2♂♂), *ESB* (HD).

*Sigara (Halicorixa) stagnalis* (Leach) Sp. 508 p.395

D & S p.596 (*C.lugubris*) and p.597 (*C. stali*)
S p.334 (*C. lugubris*)
B p.577 (Sp. 435, *C. lugubris*)

Rare. Found patchily distributed in ponds, pools, and in dykes on the saltmarshes in the Thames estuary. There have been two records of this brackish water species occurring in a freshwater haibtat (one in Middlesex, the other in Kent — see below). Three generations are believed to take place during the year; one in spring, the next in July and the final generation matured by mid-September. It is these adults that overwinter. There are unlikely to be records for this species in Herts., Surrey or Bucks., but it should be searched for along the Essex side of the River Thames estuary.

Middx. Hanwell, 15.vi.05, *AJC* (HD).

Kent. In the London district (without further provenance), *GCC* (BM); Blackheath, 27.xi.57, a single ♂ in pond on the Heath, along with *S. lateralis* and *S. dorsalis*, 'an interesting record of a brackish-water species in a freshwater habitat', *AAA* (51); Plumstead

Marshes, 28.ix.1895 and 8.v.1897, in ditches, *WW* (60) (4) (SL); 1902, *WW* (39) (22); and on the boundary at Gravesend, *D & S* (4) (22); *JAP* (BM); *GCC* (BM); and beyond at Higham Marshes, *AAA* (22)

*Sigara (Halicorixa) selecta* (Fieb.) Sp. 509 p.396
B p.578 (Sp. 436, *Corixa selecta*)

Rare. Southwood and Leston in their *Land and Water Bugs of the British Isles* state that 'the Thames saltmarshes support it in great numbers'. Most of such saltmarshes lie outside the L.N.H.S. area, but the species needs to be searched for in any likely saltmarsh along the Thames that is within our boundary, both on the S. Essex side as well as those on the N. Kent shore. *S. selecta* is aid to have a life-cycle similar to that of *S. stagnalis*.

ESSEX. Beyond the boundary at S. Benfleet, 24.iv.49 (2♂♂ 2♀♀), in brackish ditch, *ESB* (HD); Benfleet, 24.iii.51, *DL* in *WJLeQ* coll. (21).

KENT. On the boundary at Gravesend, *JAP* (BM).

End of Part XIV

Part XIV completes the enumeration of the Heteroptera occurring in the London Area. The species are arranged according to Southwood, T.R.E. and Leston D., *Land and Water Bugs of the British Isles*, Frederick Warne & Co. Ltd, London and New York, 1959.

A final part (Part XV) giving additions, corrections, a summary and an index, will complete the present series.

# Fleas of the Grey Squirrel *Sciurus carolinensis* Gmelin in Epping Forest

by K. R. Snow* and S. J. Ball*

The grey squirrel was introduced into this country from North America on numerous occasions during the nineteenth and early twentieth centuries. It has spread from a few centres over much of the deciduous wooded areas of Britain, replacing the native red squirrel *Sciurus vulgaris* L. (Freeman 1941; Lever 1977).

Red squirrels were common in Epping Forest during the last century, but by the time of the First World War had become scarce. However, by 1936 the red squirrel was common again only to become extinct in the Forest some time between 1957 and 1960. Meanwhile the grey squirrel began to colonise Epping Forest. There are early records of grey squirrels in Wanstead Park in 1917 and in Loughton and Epping in the early 1920s. These early invaders did not thrive and it was not until 1938 that the grey squirrel became permanently established in Epping Forest. There was thus a 20-year period when red and grey squirrels co-existed in the Forest. This is a much longer period than normal, probably due to the ability of the red squirrel to compete well in its preferred habitat of large woodlands (Harris 1974).

The aim of the present investigation was to determine the species of flea present on grey squirrels in Epping Forest. The flea *Orchopeas howardi howardi* (Baker) was introduced into Britain with its grey squirrel host (Tittensor, 1977) and was first recorded in this country by Donisthorpe (1925) from the drey of a grey squirrel in Windsor Great Park. However, according to Smit (1957a), the flea *Ceratophyllus sciurorum sciurorum* (Schrank) was at that time common throughout the British Isles on its principal host, the red squirrel, but occurred on grey squirrels where these had replaced red squirrels. More recently, George (1974) indicated a wide but thin distribution of *C. s. sciurorum*, which is declining with its red squirrel host.

Apart from these two squirrel fleas, grey squirrels have also been found parasitised by the bird fleas *Dasypsyllus gallinulae gallinulae* (Dale) and *Ceratophyllus gallinae* (Schrank), the rabbit flea *Spilopsyllus cuniculae* (Dale), and the small-mammal fleas *Malaraeus penicilliger mustelae* (Dale), *Megabothris walkeri* (Rothschild), *Ctenophthalmus nobilis nobilis* (Rothschild) and *Peromyscopsylla spectabilis* (Rothschild) (Freeman 1941; Smit 1957b; Jawdat 1975; Britt and Molyneux 1979).

During September 1982—January 1983 and November 1983—March 1984, 96 grey squirrels were examined from five sites in Epping Forest: Pole Hill, Leyton Flats, Ambersbury Banks, Sewardstonbury and Woodbury Hollow. Because fleas readily leave their host after its death and during handling, squirrels were placed individually into labelled polythene bags, together with a large swab of cotton wool soaked in chloroform, as rapidly as possible after being shot. Even so, because of their rapid movement, no attempt was made to draw conclusions regarding their distribution on the host. The squirrels were carefully combed to remove fleas and then skinned. The skins were cut into portions, dissolved in 5% potassium hydroxide solution overnight and the filtered remains searched for any additional fleas.

Of the 96 squirrels examined (55 males and 41 females), 60 (62.5%) were found to be parasitised by fleas. *Orchopeas h. howardi* was the only species recorded. Of

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the 504 specimens recovered, 240 were males and 264 females. The mean density was 8.4 fleas per host in the 60 squirrels which were infested. The highest number of fleas recorded on an individual squirrel was 41. No significant difference was observed between the numbers recorded on male and female squirrels.

Throughout this paper the nomenclature used follows that given by Kloet and Hincks (1976).

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# Book Reviews

*The Moths and Butterflies of Great Britain and Ireland.* Vol. 10, *Noctuidae (Cuculliinae to Hypeninae) and Agaristidae.* Editors John Heath and A. Maitland Emmet. Harley Books, Colchester. 1983. 459 pp., 13 col. pls. £40. ISBN 0 946589 01 1.

In spite of being volume ten, this is only the third of an eventual series of eleven covering the entire lepidopterous fauna (including a volume of larvae) of the British Islands, and already the series has been widely acclaimed as *the* standard reference work in this area. This claim is entirely justified.

In completing the family Noctuidae — the first part was included in volume nine — some 422 references are listed, emphasising the considerable amount of time and effort that has been put into this section by the authors Messrs Bretherton, Goater and Lorimer. Each subfamily of the Noctuidae is introduced by means of a key to the imagines (adults), and these are useful in that they actually work when tested on specimens of known identity. This should be particularly useful to beginners and non-specialists using the book to identify material, since the illustrations leave something to be desired. Indeed, the coloured illustrations are the major cause for criticism; whilst being slightly improved since volume nine they are still far from perfect and inexperienced readers should err on the side of

caution if comparing them to specimens for the purpose of identification. For example, *Amphipyra pyramidea* (L.) and *A. berbera svenssoni* Fletcher, are depicted (Plate 5, Figs 31, 32 and 35) as being strikingly different species on the morphology of the upper wings. This is certainly not the true case in the majority of specimens that I have seen, and indeed the striking similarity of the two species was responsible for the fact that *A. berbera* was not distinguished as a distinct species until as recently as 1968! It is only right to point out however, that these similarities and differences are correctly listed in a most excellent text which I commend to all.

Three other criticisms are apparent. Most copies that I have come across, including my own, have an annoying red spot on the left forwing of *Gortyna borellii* Freyer, (Plate 8, Fig. 33); the nomenclature in Russel Bretherton's excellent chapter on migrants is not entirely in tune with that used in the reference section of the volume; and there are some apparently misleading dots on the distribution maps of certain species, presumably computer errors that escaped notice at proof stage.

All in all, this is an outstanding volume in an outstanding series which seems to get even better as each new volume appears. It should appeal not only to lepidopterists, but also to other entomologists, birdwatchers and anyone else who spends time out in the countryside and is thus likely to encounter butterflies and moths from time to time. It may be worth noting that volumes one and nine are still in print, and are available from Harley books at £30 and £32.50 respectively. It comes as no surprise to learn that volume ten was selected by the British Printing Industries Federation as one of the best produced and designed books of 1983 — a total of sixty were selected. I look forward with growing impatience to the publication of volume two in November 1984.

C. W. PLANT

*The London Encyclopaedia.* Edited by Ben Weinreb and Christopher Hibbert. 1029 pp., over 500 illust. Macmillan, London. 1983. £24. ISBN 0 333 32556 7.

Since this is the bicentenary of the death of Samuel Johnson, one is reminded of his claim that 'anyone who is tired of London is tired of life'. This is a self-contained volume of some 5,000 entries listed alphabetically. It was compiled by Ben Weinreb, who has devoted most of his life to the history of London, later joined by Christopher Hibbert, known for his biographies. A list of contributors includes a considerable number of local historians and borough archivists, as well as the Society's Rodney Burton, Jeremy Cotton, David Montier and Colin Plant.

Its thousand pages are crammed full of facts and history of places both extant and vanished. Unlike many other 'London' books, this covers the whole of Greater London and its fringes, although, naturally, Inner London gets the lion's share. Many of the entries are illustrated by pictures — over 500 drawings or photographs from a wide variety of sources — sometimes a little too small, but effort has been taken to use early prints or photographs, rather than the simpler expedient of present-day views. The entries are, on the whole, historico-geographical, although some other features are mentioned: Haydn's London Symphonies are included, and the L.S.O., but the 'London Bach' only in passing. London Rocket and London Plane have entries, but London Clay is omitted. Subjects are cross referenced and there are two large indexes: one general and the other to the 10,000 people mentioned in the text. Institutions are mentioned and the L.N.H.S. commands an inch of column, albeit without an address.

It is inevitable that a work of this extent and complexity will eventually become out of date: and it is inevitable that if one tries hard enough, one will find some omissions, some errors, and some spelling mistakes. However, these are minor and should not detract from the book being a quarry of facts. A critical look at some of the more arcane topics will show that despite the brevity, all the important facts are present, and for most part, up to date, which testifies to real research, rather than a slavery of established textbooks. Anyone who leads field trips or goes sightseeing in London will find this book an invaluable guide, although at 4½lbs it is not suitable for the pocket. It should be on the shelves of every specialist and public library in Greater London and the Home Counties, if not the whole of Britain.

JOHN CRESSWELL AND DOREEN WOODS

# Survey of Bookham Common:
## FORTY-SECOND YEAR
## Progress Report for 1983

### General (G. Beven*)

It was a great loss to the Survey when Wilfred D. Melluish died on 30 May 1983. He was an expert ornithologist, who worked especially on the birds of the plains from 1954 until within a few months of his death. He contributed several articles on the birds. Two especially important papers included censuses of the birdlife of the plains in 1960 and 1969 and showed the population changes that take place with the growth of scrub. He was a modest, generous and extremely courteous person who showed great consideration towards everyone. He was much appreciated by every member of the Survey team. In this memory, his son Stewart, has presented to the Survey team two of his books, *Finches* by I. Newton and *Man and Birds* by R. K. Murton.

We were also very sorry to hear that Leslie Baker died on 30 August 1983. For many years he and B. A. Richards, who died in December 1979, together did an all-night ramble on the Common in May or June and sent us valuable notes, chiefly on the birds. They were the first, since the Survey started in 1941, to record the presence of the adder *Vipera beris* in 1954, and the quail *Coturnix coturnix* in 1979.

### Weather notes for the period September 1982 to August 1983 (O. B. J. French†)

On the whole a very mild damp year, but our area escaped the worst of the weather affecting places elsewhere in the country. There were only three days of frost during November, sixteen in December and five in January. February was the coldest month of the year with twenty-two days when frost was recorded, a minimum of −7°C(19°F) and an overall mean of 0°C(32°F). There was little snow; flurries fell on one day during December but there were falls on six days during March; none during other months. The warmest month was July when the temperature just touched 32°C(90°F) on a single day in the middle of the month, giving a mean overall of 19.6°C(67°F). The weather can be summarised with the help of the *Daily Telegraph* monthly weather commentaries: September — the warmest since 1947; October — a disaster month on the farm with heavy rainfall; November — rather mild and wet; December — this month brought the coldest days of the winter so far with widespread freezing fog; January — after a wet and windy New Year, the fourth mildest month on record; February — snow brought chaos to many areas; March — the first half warmer than the second, but hail and snow disrupted the rest of the month, particularly towards its end; April — a wet and cold month with blizzards bringing a white Easter to some parts of the south-east; May — a month of depressions, fog and rain with a record rainfall in sight on 22nd; June — the month stormed in with floods and lightning, a summer with few swallows; July — this month gave us the hottest spell for 300 years; August — cooler after the warmest July on record and storms and flooding affected much of the south-east early in the month.

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## **Vegetation** (Bryan Radcliffe*)

In the course of the recent survey of the flora (1981 *Lond. Nat.* **60:** 68-84) no serious attempt was made to identify the microspecies of *Rubus fruticosus* Agg. Work has now started on this and it is hoped that a reasonably complete picture can be built up over the next few years.

Specimens have been collected by Veronica Pilcher, Ken Page and Alan Leslie, initially for determination and also to provide a reference collection to aid other members of the team in the work of identifying bushes on other parts of the Common. The majority of specimens have been identified by Alan Leslie: in a few cases confirmation was obtained from Alan Newton.

Species identified, and the divisions in which they have been found so far, are as follows:

| | | | |
|---|---|---|---|
| *Rubus averyanus* | Q | **R. formidabilis* | L and M |
| *R. balfourianus* | Q and N | *R. moylei* | S |
| **R. britannicus* | B | **R. polyanthemus* | Q |
| **R. cardiophyllus* | C and P | *R. rufescens* | M |
| *R. conspersus* | M and T | *R. subinermoides* | M and N |
| *R. echinatus* | D | **R. ulmifolius* | common in open areas |
| **R. flexuosus* | C and P | | |

Those marked with an asterisk were recorded by W. Watson in 1945.

An interesting plant found by Ken Page and named by Alan Leslie is the hybrid between the dewberry and raspberry *Rubus caesius* × *idaeus*. Although both parent species are common the hybrid is very rarely seen. Just one plant is known on Bookham Common, in division M.

Other plants of interest during the year were *Cotoneaster bullatus* in division S, seen by Ian Swinney and confirmed by Ken Page, and *Prunus lusitanica*, reported by Ian Swinney in divisions C and I.

## **Fungi** (Pamela Goldsmith**)

The following species, new to Bookham Common, were found during 1983:

| | |
|---|---|
| January and May | *Phellinus ferreus* on hawthorn in Eastern Wood. |
| April | *Psathyrella obtusata* in Hillhouse Wood. |
| October | *Tremella foliaceae* on deciduous branches in South-east Wood. |
| November | *Leptotrimitus incrustoporea semipileatus* on deciduous branches in Central Wood. |

All identifications were checked by an expert on fungi at Kew.

## **Aquatic Invertebrates** (all J. W. Coles‡)

### **Protozoa**

*Stentor* sp. On 13 November bright green specimens were very common in Western Hollows Pond. Some blue-green specimens were found also.

### **Coelenterata**

*Hydra viridis* L. Green hydra were quite common in the Western Hollows Pond on 13 November.

### **Aschelminthes: Rotifera**

Planktonic rotifers were abundant in the Isle of Wight Pond on 13 November. It is likely that they represent species which were collected and determined by Charles Hussey in June 1982 (1983 *Lond. Nat.* **62:** 90).

*The Stores, Green Road, Wivelsfield Green, Sussex RH17 7QA.

**14 Mayfield Road, Wimbledon SW19 3NF.

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**Aschelminthes: Nematoda**

*Tobrilus ?pellucidus* Bastian. Only one female found in Isle of Wight Pond on 13 November.

*Monhystera paludicola* De Man. One female found in Eastern Hollows Pond on 13 November.

**Crustacea: Copepoda**

*Acanthocyclops viridis* (Jurine). On 13 November were quite common in Isle of Wight Pond and Western Hollows Pond.

An incomplete exoskeleton of a species also found in Eastern Hollows Pond.

**Crustacea: Cladocera**

*Daphnia longispina* O. F. Müller. Common in Eastern Hollows Pond on 13 November.

*Pleuroxus aduncus* (Jurine). Common in Isle of Wight Pond on 13 November.

*Pleuroxus uncinatus* Baird. Common in Isle of Wight Pond on 13 November.

*Macrothrix laticornis* (Jurine). Isle of Wight Pond on 13 November.

Both species of *Pleuroxus*, as well as *M. laticornis*, were found and identified by John Hearn from ponds on the Common, in samples taken in 1975 (1976 *Lond. Nat.* **55:** 20-22).

**Crustacea: Amphipoda**

*Gammarus* sp. (juveniles). Found in Eastern and Western Hollows Ponds on 13 November.

**General note**

Although quite a number of invertebrates are plentiful in the Isle of Wight Pond, there is no apparent improvement in the growth of plant life and other conditions as was noted in 1978 (1979 *Lond. Nat.* **58:** 40-41).

All the crustaceans were identified by Dr G. A. Boxshall.

## **Arachnida: Araneae** (Eric W. Groves*)

### ***Tetragnatha striata*** *L. Koch, a spider new to Bookham Common, with the damselfly* ***Coenagrion puella*** *(L.) as prey*

Among a clump of soft rush *Juncus effusus* that had grown up in the area 493 west of the Research Hut, cleared and dug when the sewer pipe had been laid in 1979, I observed on 12 July 1981 a single example of the interesting spider *Tetragnatha striata* L. Koch, not previously recorded from Bookham Common in the revised list of Arachnida by Le Gros (1973).

The spider had its web slung between stems of the *Juncus* at about 45 cm (19 inches) from the ground and my attention was drawn to that direction by the bright blue of a damselfly caught in the web as prey. This I recognised as *Coenagrion puella*, a fairly common damselfly at Bookham.

I was able to watch the spider feeding on its prey for some minutes but it became disturbed when I approached too close, whereupon it left the web and moved away to the side on to a nearby rush stem. When settled there it became almost inconspicuous, lying with its legs fore and aft of its thin body which it kept closely pressed against the *Juncus* stem. Its abdomen had two longitudinal yellow stripes on a chestnut-brown background, matching perfectly with the coloured photograph in Jones (1938: 247) with which work I have since been able to identify the spider. Both Jones (*op. cit.*) and Locket and Millidge (1953: 106) state that *T. striata* is found 'on reeds in or near water' but the example on Bookham Common

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was some 400 metres (about ¼ mile) from the nearest water of the Isle of Wight Pond. The soil at the site of the web, however, is of London Clay and remains moist to damp for eight or more months of the year.

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## **Lepidoptera** (G. Beven)

A fine summer produced numerous butterflies. There were many speckled woods *Pararge aegeria,* hedge browns *Pyronia tithonus,* meadow browns *M. jurtina* and ringlets *Aphantopus hyperantus* in July-August, a silver-washed fritillary *Argynnis paphia* was seen on High Point Path on 14 August (J.B., D.L.), and white admirals *Ladoga camilla* were quite abundant on 10 July (D.A.B., O.B.J.F. *et al.*) and one on 14 August (E.M.H.). Four purple emperors *Apatura iris* were seen on 10 July (D.A.B. *et al.*), while red admirals *Vanessa atalanta,* small tortoiseshells *Aglais urticae,* peacocks *Inachis io* and commas *Polygonia c-album* were recorded May-July and the purple hairstreak *Quercusia quercus* was common on 14 August (J.B.). Brimstones *Gonepteryx rhamni* were seen March-August and four clouded yellows *Colias croceus* were noted on 7-14 August (J.B., E.M.H., I.S.), a green-veined white *Pieris napi* in May and skippers, small *Thymelicus sylvestris* and large *Ochlodes venata* in June-July. A hummingbird hawk moth *Macroglossum stellatarum* was at High Point Path 388 on 14 August (J.B.), and a brown china mark *Nymphula nymphaeata* was by South-east Pond on 10 July (D.A.B.).

Observers: J. Bratton, D. A. Boyd, O. B. J. French, Ella M. Hillman, D. Langlois.

## **Fish** (G. Beven)

In September Handley's Cottage Pond 578 dried out exposing a pike *Esox lucius,* weighing 1620 grammes (3½ lb.) and about 40 carp *Cyprinus carpio,* 8-10 cm. long. All the fish probably spread from the Isle of Wight Pond (A.S.). On 25 June four large carp were seen sunning themselves near the surface of Eastern Hollows Pond (A.P.). Two carp were leaping in Isle of Wight Pond on 14 August (E.M.H.).

## **Amphibians** (G. Beven)

Ian Swinney reports some further instances of hibernation during 1983. A female smooth newt *Triturus vulgaris* was found with a male and a female toad *Bufo bufo* under a pile of wood 548 hibernating on 7 January. Another toad was found in his garden 571, 10 cm down in the soil but in a small air space on 2 February: it was making slow movements. On 11 January a male frog *Rana temporaria* was disturbed in water during ditching work on Commons Road 547, where also on 25 January fifteen frogs were found hibernating in 30 cm of water along the last metre of the ditch. These are the first known occasions of frogs hibernating at Bookham.

## **Birds** (G. Beven)

### *Population Studies in Oakwood*

The breeding season census was repeated in the 16-hectare sample of dense pedunculate oakwood in 1983 by Andrew Merritt. In 1979, 1981, 1982 and 1983 the wren *Troglodytes troglodytes* territories were 18, 23, 33 and 21, those of the blackbird *Turdus merula* 13, 20, 14 and 13, and of the robin *Erithacus rubecula* 41,

28, 28 and 26 respectively. The wren population has decreased again, the blackbirds have remained in much the same numbers and the robin population remains rather low. The number of great tits *Parus major* has decreased somewhat, the figures for the same years being 16, 22, 16 and 11 but the number of blue tits *P. caeruleus* again showed little change.

### *Population Studies in Scrub and Grassland*

The breeding season census was repeated in 39 hectares of scrub and grassland in 1983 by D. A. Boyd. Unfortunately, only five counts could be made between March and July, so that the figures may be underestimates. The number of territories for 1980, 1981, 1982 and 1983 respectively were, for wrens 10, 17, 16 and 18, for robins 33, 20, 20 and 20, and for blackbirds 27, 25, 19 and 12. Thus the wren and robin populations have remained much the same while the number of blackbirds has decreased.

### *Other Notes on the Birds during 1983*

A little grebe *Tachybaptus ruficollis* was seen on a nest on Eastern Hollows Pond on 8 May and also on 12 June (D.A.B., A.M.). A pair of mute swans *Cygnus olor* nested on Eastern Hollows Pond and produced four cygnets which were present on the Isle of Wight Pond on 27 December (D.A.B., A.M., I.S.). A Canada goose *Branta canadensis,* found dead on Isle of Wight Pond on 21 April, was found to have its intestine blocked by a large piece of plastic litter it had swallowed (I.S.). On 9 April a drake mandarin *Aix galericulata* was near Common Road 821 (I.S.).

### *Woodcock*

Woodcock *Scolopax rusticola* have probably nested in the oakwoods of Bookham Common for many years, but roding was not recorded by the Survey team until 1945 (B.A.R.), 1949 (P.W.E.C.) and 1950 (R.W.H.). Since 1945 birds have been recorded in most years when observers have remained until dusk. At least one was observed roding in 27 years, but two or more roding males may meet over the 'Isle of Wight area' and were seen in 13 of these years (many observers), and three roding in a further three years 1967, 1968 and 1983 (C.B.A., G.B., E.M.F., F.C.R., B.J.S., M.W.), while in one year (1977) there were four roding together (N.D.). Roding has been seen over the following woods, Stent's, Lady Chewton's, Mark Oak, Eastern and South-east Woods as well as Banks' and Western Plains, and the Isle of Wight and Eastern Plain. Without radio-tracking it is impossible to tell whether a bird roding over another part of the Common is a different bird or the same bird in another part of its roding flight path. According to Cramp and Simmons (1983), it 'has been widely believed that the male is territorial during the breeding season, with roding repeatedly performed along particular flight lines..., however this is brought into question by evidence that many males appear to compete over the same wide area, and plotting of 743 timed tracks of flights by single birds and 85 involving two birds, all over one small site, failed to demonstrate the use of a regular circuit by any individual.' The authors found that radio-tracked males did not delimit particular territory, the area flown over varied nightly and males were without exclusive feeding and displaying areas.

Nests have been found on 11 occasions, in 1952 (D.L.), 1964 two (A.G.C., E.H.H.), 1968 (P.S.), 1969 (C.R.A.C.), 1971 (M.T.), 1974 (J.R.M.), 1975, 1976 (K.F.B.) and 1977 two (N.D., O.B.J.F.). These have been in Lady Chewton's, Sheepbell, Eastern and Central Woods. There were three nests containing eggs (number of eggs in brackets), in March (4), April (2) and May (4). Young were found in seven nests (number of young in brackets), in April two nests (2-4, 4), May four nests (3, several, 2, 2,) and June (4).

Single birds have been seen in autumn and winter (number of records in brackets), August (7), October (4), November (1), December (4), January (9)

and February (12). On 16 June 1968 P. Strangeman saw a bird of the year, fluttering on the edge of Central Wood.

*Pipits and Wagtails*

**1.** Tree pipits *Anthus trivialis* increased from seven pairs in 1943 (Carrington *et al.* 1944) and seven pairs in 1947 to thirteen pairs in 1948 and ten pairs in 1949 (Currie 1950) on Western, Isle of Wight, Bayfield and Central Plains. There was also one pair on Eastern Plain in 1943 and from 1947 to 1949. On 16 March 1948 the grass of most of Western, Isle of Wight and Bayfield Plains was deliberately burnt to 'improve the grazing'. It is interesting to note that the tree pipit population was very large in that year (1948) but from then on the population gradually declined to none in 1955-6, one in 1957 and then none. Before 1925, when the National Trust acquired the Common, the plains were extensively grazed by domestic animals, the grass was close cropped and there were few bushes. After 1925 grazing became much reduced and ceased in 1949. The increase in size and number of shrubs was at first slow but it became much more rapid in the mid nineteen-fifties. By then the grass and bracken had become too tall and dense, and there was much scattered hawthorn, bramble and blackthorn. Apparently the habitat had become unsuitable for tree pipits. However in 1967 there was some clearing of scrub on Bayfield Plain and one tree pipit sang there at 841 on 10 May 1970 (L.B.), and one also sang there at 844 on 10 June 1973 (E.M.H.). In addition following some clearance of shrubs and cutting of bracken four times in 1970 on parts of Western Plain, two three pipits were heard to sing there on 19 April 1971 (K.G.).

Similarly, on Eastern Plain by 1968 there had been much growth of saplings of birch, willow and oak, which were spreading over the whole plain, and some clearing of these was done in early 1968, when a fire also destroyed some more saplings. Bracken at that time covered most of the Plain. During that year (1968) a tree pipit was singing from 29 April to 30 May and a pair was present (G.B., P.S.). During 1969 the bracken was cut four times and was only 15 cm (6 in.) high in September (compared with 2.4 m high where it was not cut), when *Molinia* was beginning to spread in its place; in addition there was some clearance of birch and bracken (Hillman 1970); on 29 May to 13 July 1969 a tree pipit was singing (D.V.F., R.G., P.S.). In 1970 the bracken was cut twice and a tree pipit sang on 12 July 1970, but there have been no further records although control of the bracken has been continued.

Presumably the habitat is not yet quite suitable for tree pipits, but it is not clear what more needs to be done. Certainly the very large number of domestic dogs now seen on the Common must make it extremely difficult for ground-nesting birds to breed successfully.

**2.** In the early years of the Survey meadow pipits *Anthus pratensis* were observed settling into long grass on the plains at dusk, presumably to roost, either singly or in parties of 5-10 birds. They were noted mainly during the winter from mid-September to early April, in the following years: 1941 to 1943 when there were 'fair numbers' on the sewage farm (Carrington *et al.* 1944), from 1944 to 1946, in 1947 when 'many' were on the sewage farm, in 1948 and 1949 when there were larger flocks of 10-30, in 1950, from 1954 until 1958, in 1961, 1965 and 1974. They were seen more often in the early years up to about 1955. This was presumably because, although there was some long grass for use as a roosting area, there were also areas of shorter grass available for feeding in and these had become scarce by 1955, when also the scrub cover had greatly increased. Since 1955 meadow pipits have become much less frequent and are now seldom recorded (G.B., P.W.E.C., W.D.M., A.R.W.).

**3.** Yellow wagtails *Motacilla flava* have been recorded on three occasions, i.e. 14 May 1974 one by Isle of Wight Pond (R.P.), 14 September 1980 one (A.M.) and one on Western Scrub 426 on 12 July 1981 (D.A.B.).

**4.** Although a pair of grey wagtails *Motacilla cinerea* was feeding young in the nest on the edge of the River Mole at Stoke D'Abernon, less than 1.6 km (1 mile) to the north of the Common in May 1971 and a singing male with a hen were observed along the stream at Hundred Pound Bridge on 29 March 1974, there is no definite record of breeding on the Common. However single birds have often been seen in autumn and winter, chiefly by the ponds and by Bookham Stream, in 1944, 1957-9, 1965, 1968-70, 1972 and 1976-80.

**5.** There are a few breeding-season records of the pied wagtail *Motacilla alba*, e.g. on 5 June 1968 young birds were being fed by adults near the car park 947 (A.G.C.), and on 13 May 1972 one was seen on a chimney pot of Bookham Grange Hotel feeding a young one (L.B.). Also on 13 May 1972 there was a bird attacking its image in the wing mirrors of a car near the sewage farm, for 30 minutes almost without a break (L.B.). Occasional birds are seen at other times, especially near the Isle of Wight Pond, where also between October and December 1964 and again in 1965, flocks of 30-80 were coming into reedmace and willows on the pond (F.C.R.). On 9 February 1947 40 were seen on the roof of Bookham Station and a nearby factory at dusk (P.W.E.C.) and twice in October 1978 a flock of about 50 perched along telephone lines on the Isle of Wight (N.D.). Parties used to visit the sewage farm, e.g. 12 March 1944 20 (A.R.W.), 9 February 1947 'many' (P.W.E.C.) and 13 January 1957 26 (G.B.).

### *Decline of the Grasshopper Warbler*

The numbers of territories of grasshopper warblers *Locustella naevia* in the 39 hectares of scrub and grassland each year were as follows: from 1962 to 1971 — 1, 3, 2, 1, 6, 3, 5, 6, 5 and 5, and from 1972 to 1983 — 4, 4, 3, 2, 2, 0, 0, 0, 0, 0, 0, and 0 (G.B., W.D.M.). This indicates a peak of population in 1966 and again in 1968-73, then the numbers decreased, until in 1977 grasshopper warblers were not found on the Common and they are still (1983) absent. No local cause for this decline has been found. This species has also decreased in parts of Surrey, where the number of singing males for the years 1962 to 1971 were 25, 16, 22, 14, ?21, 'several', ?33, 44, 140 and 66, and for the years 1972 to 1981 were 50, 34, 23, ?13, 20, 12, 11, 20, 19 and 15 (*Surrey Bird Reports* annually from 1964 to 1982). Thus these figures also suggest a peak of population in the period 1968-73, and these reports also mention that these warblers disappeared from six other localities in Surrey, besides Bookham Common, between 1973 and 1976. It has also been shown that at nine British Bird Observatories on the east, west and south coasts grasshopper warblers were much more numerous in the period 1964-72 (notably between 1966-70) than between 1973 and 1979, with a marked decline in numbers in the spring and autumn of 1973 and subsequently (Riddiford 1983). The cause of this decline is unknown.

### *Wood Warbler*

In the wood near Sheepbell Farm 329 where there are a few beeches and less dense undergrowth, a pair of wood warblers *Phylloscopus sibilatrix* was present from 11 May 1968 and on the 7 June a nest was found there containing six young, about two days old, which left the nest on the 18 June (A.G.C.). On 18 May 1971 one sang repeatedly there 329 (G.B.).

There have been no other records of breeding, but singing males have been heard in the latter half of May or later i.e. 13 June 1943 one in Mark Oak Wood (A.R.W.), 4 June 1949 one in South-east Wood and one on 24 May 1953 in Hill House Wood (P.W.E.C.), 31 May 1964 two in Central Wood (F.C.R.), 11 June 1967 two in Eastern Wood (E.M.F.), 30 May 1968 one in South-east Wood (P.S.), one on 5 July 1969 and one on 22 May 1983 (A.M.), both in Central Wood. There are more records of males in song before mid-May, but these are considered as possibly passage migrants i.e. 1944 (1), 1946 (1), 1948 (1), 1951 (3), 1953 (1), 1956 (1), 1964 (3), 1973 (1), 1976 (1), 1981 (2) and 1983 (1).

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Observers: C. B. Ashby, L. Baker, K. F. Betton, G. Beven, A. G. Channor, C. R. A. Clegg, P. W. E. Currie, N. Davies, E. M. Forsyth, O. B. J. French, D. V. Freshwater, K. Gold, R. Griffith, R. W. Hayman, E. H. Herbert, Ella M. Hillman, D. Longhurst, W. D. Melluish, A. Merritt, J. R. Mullins, A. Piper, R. Price, F. C. Reeves, B. A. Richards, B. Short, A. Snow, P. Strangeman, I. Swinney, M. Towns, Mary Waller, A. R. Wilton.

## **Mammals** (G. Beven)

### *Notes on the mammals during 1983*

On 17 February 77 grey squirrels *Sciurus carolinensis* were shot by a National Trust team 'pushing-out' dreys (I.S.). Roe deer *Capreolus capreolus* remain quite common, single deer were noted on ten occasions, a pair was seen seven times, a group of three in November and one of four in March (O.B.J.F., E.W.G., A.M., A.P., I.S.).

### *The Water Vole*

Water voles *Arvicola terrestris* occur commonly along the banks of the Isle of Wight Ditch, other ditches e.g. 548, Bookham and Banks' Streams and the Isle of Wight Pond (G.B., D.A.B., N.D., E.W.G., A.M., I.S., G.W.). They may be seen swimming or heard to dive with a loud plop or splash. There are numerous burrows, some opening above the water and some below the water surface and then rising steeply. On 11 November 1968 several burrows in the dam of the Isle of Wight Pond seemed to be causing some collapse there. Claw marks are often visible at the edges of the holes. Shiny, black, rather soft droppings may be seen by the holes, and on a white painted board floating on the water, and on a board across the stream just above the surface of the water, or on the side of a metal bucket, lying on its side with one side just above the surface (G.B.). Droppings are given as perfectly cylindrical, 10-12 mm long and khaki to light green in colour (Corbet and Southern 1977), while Ryder (1962) states that the droppings are black, shining and slightly compressed when fresh, but when old become putty coloured. In August-September water voles may be seen, sometimes on their hind legs, and often making very loud crunching noises, feeding on the stems and leaves of reed mace, an occasional stem toppling over, and on the leaves of willow (G.B., C.P.C., P.F., E.M.H.). On 22 March 1967 E. M. Forsyth caught a water vole and was bitten by it 884.

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## *CORRIGENDA*

**1.** In **The Bryophyte Flora of Bookham Common,** by R. C. STERN and O. B. J. FRENCH (1983, *Lond. Nat.* **62:** 97-104), two of the species given as new to the Common since 1967 (p. 99) had in fact been recorded previously: see *Lond. Nat.*

**54:** 50. These are *Pohlia carnea,* formerly *P. delicatula* (1943) and *Tetraphis pellucida* (1916). However, the latter date, 1916, is also incorrect, since when a date is given after a sequence of records in Peterken (*Lond. Nat.* **40:** 61), from which this is taken, it refers only to the last of the series and so does not apply to *T. pellucida.* As this record was made by Peterken himself, the date is almost certainly 1942-3.

The following are additions and corrections to the systematic list on pages 100-104:

| | |
|---|---|
| *Ceratodon purpureus* | add area T. |
| *Dicranum scoparium* | add areas ACDEFIJKNOP. |
| *Campylopus introflexus* | should be 9 areas, add area O. |
| *Totula laevipila* | should be *Tortula laevipila.* |
| *Barbula unguiculata* | should be 4 areas, add areas Q and S. |
| *B. recuvirostra* | should be *B. recurvirostra.* |
| *Orthodontium lineare* | add area N. |
| *Pseudoscleropodium purum* | should be 11 areas. |
| *Rhynchostegium riparioides* | for area D read O. |

The authors are grateful to Miss E. M. Hillman for drawing their attention to a number of these errors and omissions.

**2.** In the **Progress Report for 1982** (*Lond. Nat.* **62:** 89), **Bryophytes,** there are two errors in the species list: for *Polytrichum longirostrum* read *P. longisetum* and for *Dicraus montanum Dicranum montanum.*

# Notes on the Dragonflies of Bookham Common

by J. H. Bratton* and D. Langlois**


## Summary

A comprehensive survey of the Bookham Common Odonata was last undertaken in the years 1942-44 (Payne 1945) with the presence of sixteen species at that time. The past thirty years have seen large scale change in the countryside surrounding Bookham Common, thus it seems timely to reappraise the status of dragonflies on the Common. Notes of the dragonflies present were made at roughly three-week intervals through the summer months of 1982 and 1983 by J. Bratton and more frequently during 1983 by D. Langlois. In addition, R. D. Hawkins of Horley kindly allowed the incorporation of his dragonfly records from June and August 1980.


To facilitate the incorporation of the records into county and national mapping schemes, the grid references of the ponds are as follows:

| | |
|---|---|
| Isle of Wight Pond TQ126562 | West Hollow TQ127563 |
| East Hollow TQ128563 | Lower Eastern Pond TQ130563 |
| South-East Pond TQ131560 | Sheepbell Pond TQ133569 |

Flight periods of the dragonflies on the Common in 1982 and 1983 are given in Table 1. The more intensive recording in 1983 allowed the flight periods to be more accurately determined in that year. However, the emergence of some species may have been set back by the cold spring of 1983 and thus not be representative of a normal year.

The nomenclature follows Hammond (1983).

### *Aeshna cyanea*

This species emerges in large numbers from South-East Pond and probably several of the other ponds. On 13 June 1982, at the joint L.N.H.S./Quekett Microscopical Society meeting, thirty-one exuviae were collected at S.E. Pond, and further exuviae continued to be found up to 8 August. In 1983 at this pond thirty exuviae or nymphs which had left the water were found on 25 June, but *A. cyanea* was not observed hawking until 17 July. Thus this species would appear to need at least a three week maturation period after emerging. Freshly emerged individuals are often encountered during the afternoon, and one began emerging from its nymphal case at 6.20 pm on 25 June, being free of its case by 7.00 pm Expansion and drying of the wings would probably not have been complete before dusk. These daytime emergers may be exceptions to the norm. Most members of the Aeshnidae usually emerge at night, but a drop in air temperature can cause nymphs to return to the water, and these often re-emerge and hatch into adults the following morning (Corbet *et al.* 1960). *A. cyanea* is one of the last species to be seen in the autumn at Bookham. One individual was seen ovipositing at Sheepbell Pond on 1 November 1981.

### *Aeshna grandis*

This species is abundant, and egg-laying has been observed at East Hollow, West Hollow and S.E. Pond.

### *Aeshna mixta*

This is a recent colonist of Britain, and was first recorded at Bookham Common during the 1942-44 survey. It is now common through much of lowland England (Chelmick 1979), the English name scarce aeshna no longer being apt. Egg-laying

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was observed at East Hollow on 23 September 1983 and a pair in tandem was seen at Lower Eastern Pond three days later. This species has not been seen on the smaller outlying ponds on the Common, including S.E. Pond.

*Anax imperator*

*Anax* was the first anisopteran to be seen in 1983. It is not numerous, probably due to its rigorous defence of territory. The larger Bookham ponds each suffice for two territories. Egg-laying has been observed on West Hollow (25 June 1983), S.E. Pond (18 July 1983) and Lower Eastern Pond (14 August 1983). On the last two occasions the female involved showed a blue base to the abdomen, resembling a male. This colour change occurs in very old females (Hammond 1977). An exuvium was collected at S.E. Pond on 6 June 1980 proving breeding to be successful at Bookham. *Anax* has increased in abundance since the 1942-44 survey.

*Libellula quadrimaculata*

This species was not seen in 1982, and is unlikely to have been overlooked. In 1983 small numbers were present at West Hollow, and egg-laying was observed in the period 25 June to 17 July. Longfield (1949) records it as plentiful at Bookham.

*Libellula depressa*

Adults were seen at S.E. Pond, W. Hollow and Isle of Wight Pond on 6 June 1980. Only a single female was seen in 1982, at S.E. Pond on 29 May. In 1983 sightings were mainly restricted to I.O.W. Pond, where egg-laying was seen on 26 June (and 10 July — A. Merritt).

*Sympetrum striolatum*

This is the most abundant anisopteran on Bookham Common, found in large numbers on S.E. Pond and the series of five large ponds. Emergence of the adult was observed at S.E. Pond (14 August 83) thus confirming breeding. In 1983 egg-laying took place from 18 August to 26 October and the last individual on the wing was seen on 10 November.

*Sympetrum sanguineum*

By autumn 1982 there was only one definite Surrey breeding site for this species known to the Dragonfly Recording Scheme (R. Merritt, pers. comm.). The presence of large numbers of *S. sanguineum* on the Common from 8 August to 12 September 1982 raised hopes of Bookham being a breeding site too. However, only males were definitely identified, and no egg-laying or pairs in tandem were seen. Other entomologists have reported an influx of male *S. sanguineum* to S.E. England in August 1982, and at Bookham it appears to have arrived in sufficient numbers to temporarily displace *S. striolatum* from the ponds. On 8 August 1982 the only *Sympetrum* seen was *S. sanguineum* even though only eight days previously all males had been *S. striolatum*. By 21 August *S. striolatum* had re-appeared and was numerically dominant. In 1983, *S. sanguineum* again appeared, though in smaller numbers. Usually one to four males were present at East Hollow, West Hollow, Lower Eastern Pond and S.E. Pond, with a peak of nine males at S.E. Pond on 26 August. More significantly, a pair in tandem was seen egg-laying at S.E. Pond on 5 August. This pair was continually buzzed and eventually separated by a second male. A female was also present on this pond on 9 August. The permanence of *S. sanguineum* on the Common is not clear. It was not recorded in 1980.

*Sympetrum danae* (=*S. scoticum* (Donovan))

Payne (1945) notes that this species was recorded by Lucas (1900) but was not seen during the 1942-44 survey. However, Longfield (1949) records it is a 'sparse' breeding species at Bookham Common. A single male was seen at S.E. Pond on 8 August 1982. It was also present at this pond on 12 September, and two males

were seen at Lower Eastern Pond on this date. A single male at S.E. Pond on 26 August was the only 1983 sighting.

*Calopteryx (=Agrion) splendens*

Occasional sightings on the Common, mostly of males, occurred from 26 June to 14 August 1983. These are most probably emigrants from the River Mole. Large numbers of this species were present on the Mole only 1 km north of the Common (Grid Ref. TQ133580) on 25 June. Longfield (1949) records this species as breeding in the ponds of Bookham Common.

*Lestes sponsa*

This species is easily overlooked and may be under-recorded. Pairs in tandem have been seen at S.E. Pond (23 August 1980 and 8 August 82), and unpaired individuals at East Hollow and Lower Eastern Pond. On 21 August 1982 at S.E. Pond a male was seen with maroon colouration on those parts of the thorax and abdomen which are normally metallic green. The cause of this colour form is not known; possibly it occurs in very old individuals.

*Pyrrhosoma nymphula*

This species was not found in 1980 or 1982. In 1983 it was the earliest species to emerge. A male, able to fly but with its colouration not quite fully developed, was found at Sheepbell Pond on 14 May. This pond held a small colony in 1983, and a single individual was seen at Lower Eastern Pond on 25 June.

*Ischnura elegans*

Though not present in large numbers, this species is seen regularly at S.E. Pond and the main series of ponds. It would seem to have increased in abundance since the 1942-44 survey. It was recorded on 5 June 1980, but the first 1983 record was 25 June, perhaps reflecting the cold spring of 1983.

*Enallagma cyathigerum*

This is another species which has increased in abundance since the 1942-44 survey, with a distribution similar to *I. elegans*. There are early sightings of it in 1980, on 6 June at S.E. and I.O.W. Ponds. On 31 July 1982 many *Enallagma* were observed feeding on spiders in the grass on Eastern Plain (835). These were newly emerged adults, presumably not mature enough to breed.

*Coenagrion puella*

This is by far the most abundant dragonfly on the Common. On 14 May 1983 none was seen on the wing, but several were emerging from the nymphal case at S.E. Pond. At the next visit, 30 May, large numbers of teneral adults were seen, but only one mature individual hawking. The species remained abundant throughout the summer, the last sighting being on 26 September. On 25 June large numbers were egg-laying in tandem on *Potamogeton natans* leaves in W. Hollow, and attracting the attention of mallard ducklings. The ducklings would approach a pair slowly to within a metre then dash at the insects. Invariably the damselflies rose to safety.

## Discussion

*Calopteryx (=Agrion) virgo* bred regularly on the Common at the time of the 1942-44 survey, but has since disappeared, and it is probably significant that this is a species confined to running water. Banks' Stream, its former habitat, has its source outside the Common and is therefore more liable to pollution than the ponds.

A single *Brachytron pratense* was caught in 1944, and Longfield (1949) suggests Bookham Common as a good place to find this species, but none was seen during the present survey and it has become less common throughout its British range in

recent years. *Cordulia aenea* was also listed as a breeding species on the Common by Longfield (1949) but Payne (1945) was not aware of records more recent than the turn of the century. He also reports a single specimen of *Sympetrum vulgatum* caught in 1891. *S. vulgatum* is a vagrant species, for which Hammond (1977) gives the date of the last British record as 1946. One species not recorded at Bookham, but which may colonise if the water lilies in I.O.W. Pond are allowed to flourish, is the red-eyed damselfly *Erythromma najas*.

TABLE 1. Earliest and latest sightings of Odonata on the wing at Bookham Common in 1982 and 1983. Bracketed dates are those thought to under-estimate the full extent of the flight period.

| | Earliest sighting | | Latest sighting | |
|---|---|---|---|---|
| | 1982 | 1983 | 1982 | 1983 |
| *Aeshna cyanea* | (31/7) | 17/7 | 30/10 | 10/11 |
| *A. grandis* | (31/7) | 8/7 | 12/9 | 6/9 |
| *A. mixta* | 8/8 | 12/8 | 12/9 | 4/10 |
| *Anax imperator* | (31/7) | 19/6 | 8/8 | 14/8 |
| *Libellula quadrimaculata* | — | 25/6 | — | 30/7 |
| *L. depressa** | 29/5 | 25/6 | — | 14/8 |
| *Sympetrum striolatum* | 21/8 | 11/7 | (12/9) | 10/11 |
| *S. sanguineum* | 8/8 | 30/7 | 12/9 | 23/9 |
| *Lestes sponsa* | 8/8 | 17/7 | (21/8) | 31/8 |
| *Pyrrhosoma nymphula* | — | 14/5 | — | 18/7 |
| *Ischnura elegans** | 31/7 | 25/6 | (21/8) | (14/8) |
| *Enallagma cyathigerum** | 31/7 | 18/7 | 12/9 | (14/8) |
| *Coenagrion puella** | 29/5 | 30/5 | (21/8) | 26/9 |

*Also recorded 6/6/80.

Hammond (1977), bemoaning the decline in British dragonflies, wrote 'At the present time the entomologist may consider he has found a good locality if the day's activities yield ten species.' Twelve species were recorded at Bookham on 14 August 1983, and fifteen were seen during the year, so Bookham Common has a dragonfly fauna of some merit. The best ponds are S.E. Pond and Lower Eastern Pond, due probably to the hydrosere in these ponds being at an early stage with large areas of submerged aqautic plants and emergents restricted to the margins. However, in Lower Eastern Pond the *Sparganium/Typha* marsh is advancing rapidly, and perhaps sections of shore should be cleared in rotation to ensure that its current interest is maintained. Any management of this sort should take into account that *Typha latifolia* is important for the aquatic stages of *Sympetrum sanguineum* (Corbet *et al.* 1960), and has many other associated insect species.

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# Changes in the Flora of Station Copse, Bookham Common

by JOAN M. STODDART*

## Summary

A. W. Jones (1959) described the flora of Station Copse, Bookham Common based on observations made from 1954 to 1958. In 1972 Dutch elm disease appeared in the Copse and by the end of the following year most of the large trees had been felled. In 1975 I started a fresh survey of the flora with a view to placing on record the changes that have occurred.

## Introduction

Station Copse is the name given to a small triangle of land adjacent to the railway at Bookham Station, the flora of which was surveyed from 1954 to 1958 and described by Jones (1959). The other two sides were lines of tall elm trees, suckers from which, up to a height of 25 feet, had colonised the space between. However there were enough grassland species remaining, including adder's tongue *Ophioglossum vulgatum*, pepper saxifrage *Silaum silaus* and spotted orchid *Dactylorchis fuchsii*, to allow the conjecture that before the construction of the railway the site had been a meadow. Jones noted that the work had impeded the drainage and created an area wetter than the rest, supporting such moisture loving plants as ragged robin *Lychnis flos-cuculi* and marsh bedstraw *Galium palustre*.

## Changes in the Flora

In 1972 Dutch elm disease started to attack the large elms and by 8 October six of them had been felled. During 1973 more trees died and by the end of that year these too had been felled and were left lying on the site.

In 1975 I felt that with the felling of many of the original tall trees it might be interesting to re-survey the flora and I began to make notes comparing the present state of the copse with that described by Jones. It was no longer possible to distinguish the marshy area he had mentioned, although a few of its plants were still present. The passage through the copse of human beings which he gave as explanation for the presence of wasteland species was scarcely possible any longer.

In the winter of 1976-77 further clearance work created considerable disturbance. The whole area was deep in churned mud, with only a thin scattering of standing trees (sycamore, hawthorn, elder, ash and young elm suckers). Rough stacks of logs and lopped branches made exploration hazardous. Water lay inches deep in a central area where presumably a tractor had stood or turned. In the summer most of this ground was covered by seedlings, especially of *Epilobium* spp., but the areas which had been waterlogged were dry, bare and compacted. The north-west boundary was exposed as a dry ditch about one metre wide, devoid of plant life.

Willow-herbs again appeared to be the dominant plants in 1978, but there was also considerable growth of creeping buttercup *Ranunculus repens* and water figwort *Scrophularia aquatica*, which started as a close sward of seedlings, only a small proportion of which matured, as well as *Rumex sanguineus* and other docks. A year later, by which time creeping thistle *Cirsium arvense* had also come to play an important part in the vegetation, it was almost impenetrable. Growth had also

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started in the north-west ditch. In later years the increase of brambles has added to the difficulty.

The rapid growth of the ground flora prevented me from carrying out in full my intended survey of the progress of young woody plants, but it was evident that ash, willow, sycamore and others are rising above it unharmed. There had been holly seedlings after the devastation, but they seem not to be developing, although one found in 1975-76 survives. Elm suckers up to 3.5 m high are dense along the old hedge lines and in thickets within the Copse. One of the small number which has died was examined and found to have galleries of the elm bark beetle. One tree not recorded by Jones is the *Prunus* of which there are three saplings. This is probably the cherry-plum *P. cerasifera* of which there are mature specimens in cultivation nearby.

The central compacted area now supports dense rushes *Juncus* spp. Another feature that should be mentioned is an old hedge line which ran from the north-west ditch into the area of the Copse: this was also of elms, which by 1973 had been felled. Crosswort *Galium cruciata* appeared along this line in 1979 and has now spread to form two thick patches. Sweet violet *Viola odorata*, which I first noticed in 1980 after the devastation of 1976-77, has now increased all over the Copse.

### Acknowledgements

My thanks are due to many other members of the Bookham Common Survey for their prolonged patience and interest, especially to Miss E. M. Hillman and Mr K. Page for help in identification and to Dr G. Beven and Mr B. R. Radcliffe for advice preparing these notes. I must also acknowledge the assistance of Mr R. M. Burton in writing this paper.

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# Book Reviews

*Collins Guide to the Ferns, Mosses and Lichens of Britain and North and Central Europe.* By Hans Martin Jahns, assisted by A. K. Masselink. Translated and revised by Edmund Launert, Alan Eddy, Jack Laundon and Rita J. Laundon. Collins, London. 1983. 272 pp. £8.95. ISBN 0 00 219254 3.

It is difficult to know at what class of reader this magnificent book is aimed. Its bulk is made up of 655 coloured photographs which illustrate 33 genera of ferns and fern allies, 145 of mosses and liverworts and 94 of lichens. First published in German in 1980, it was intended to show species likely to be met with in Northern and Central Europe which might be identified without a microscope. It has now been skilfully translated into English and expanded to include Britain in its scope. A considerable number of the species, however, are either absent from Britain or very rare there, so that use of the book could hardly lead a beginner to true identifications. The introductions to the three divisions of the book are scholarly and exact, but the ordinary beginner, used to identifying flowers and wishing to study cryptogams, will see that the concentration ususally associated with serious students is necessary to assimilate the knowledge they contain and the nomenclature used. The line drawings illustrating the alternation of generations in ferns and those showing the life-cycle of mosses are wonderfully clear in the introductions when compared to the greatly enlarged photographs used in the other figures there. These excellent enlargements do not necessarily show clearly the point which is being introduced to a beginner without a microscope but who easily understands the line drawings. The same can be said of some of the coloured photographs; for example the line drawing of *Scapania undulata* shows the structure of plant stem much more clearly than does the coloured photograph of that plant. The use of the keys at the beginning of the text, of course, would tell the reader what the plant should look like and praise must be given for the clarity and simplicity of these keys. The use of the chemical K in the lichen key, though fully explained in the introduction, might put off the beginner.

The outstanding feature of the book, of course, is the collection of coloured photographs which make it attractive to beginner and expert. There is a wonderful selection of non-flowering plants in very natural colours all in a volume which can be carried in the pocket and those who seldom noticed these plants before will be compelled to look at them with new interest even if not found in Britain. The showing of such spectacular rarities as *Splachnum luteum* must surely inspire young and energetic readers to save up time and money to go to Northern Scandinavia to hunt for it as soon as possible.

The ferns and fern allies can easily be recognised from the photographs because of their size, but certainty of identification is not always possible from the pictures in the case of bryophytes and readers will be grateful for the line drawings clearly depicting some of the common species at the end of the book. There are so many lichens, on the British list alone, that only specialists could know them all, but this book contains a large selection of very beautiful species. All the photographs have their descriptive captions as near them as possible, which is very helpful.

A few letters have been left out in the text here and there, missed during the proof reading. The first most noticeable one is in the caption to figure 1 where the 'alteration' instead of the 'alternation' of generation in ferns is referred to. Where names are incorrectly spelt in this manner in one place the correct spelling is always to be found elsewhere.

It is amusing to note, in the index to Common Names, that all the species coming under the heading of Moss are lichens!

A. G. Side

*A Provisional Atlas of the Amphibians and Reptiles of Essex.* By The Essex Biological Records Centres, Passmore Edwards Museum, London E15 4LZ. 1983. 38 pp., A4. £1. ISBN 0 906123 04 6, ISSN 0265-5926.

Everyone interested in the study and conservation of our native amphibians and reptiles will welcome this publication. A short introduction provides the necessary background for the bulk of the work, which consists of a set of ten-kilometre and one-kilometre grid maps. Each native species found in Essex is provided with six maps, one on each scale for each of three periods, these being prior to 1960, from 1960 to 1979, and from 1980 to 1983.

Theoretically this permits one to follow changes in the status of these species with time, but the percentage coverage of the county is low, and the maps must be interpreted with great caution lest false deductions be drawn.

However, the increasing scarcity of the common frog in rural areas stands out in sharp contrast to its continuing abundance in east London and in the heavily suburbanized Southend district. The scale of this change is such that it can hardly be due to any recording bias.

A further interesting observation that can be made from the data is that the great crested newt is rather more abundant in Essex than might have been feared. In contrast, the palmate newt is rare, though it may never have been common in this lowland county.

The distribution of various introduced forms is also plotted, including here the sand lizard, native elsewhere in Britain, and a variety of exotic species. These records are of less significance, being dependent largely on activities of a few misguided people. However, as some of these introductions may become established and the animals then spread, I fully support their inclusion, if only to arouse interest in monitoring their future success or failure.

The production of this atlas is generally of a high standard; the paper is glossy and the stiff card cover is reasonably robust. Sketches of all native and some introduced forms enliven the appropriate pages. It is unfortunate that in the most important part of the work — the one-kilometre grid maps — there is the lowest standard of reproduction. The grid lines are rather obtrusive in maps on the left-hand pages and are very unevenly printed on the right-hand ones. On most maps the presence of a record is indicated by a solid filling-in of the monad, but on a few, some or all records are represented by a smudgy circle in the centre of the square, creating a discordant effect. I would also have preferred the maps to have had an indication of abundance in different grid squares, at least for the commonest species.

Ending on a favourable note, the addresses of the County Biological Records Centres are given and a comprehensive bibliography is also provided. Members of our Society may like to know that many of the records for east London were gleaned from issues of *The London Naturalist*. I can, without hesitation, recommend this book to any naturalist with an interest in either the groups or the area and hope that it succeeds in stimulating others to record these groups and to aim to fill the large gaps in our knowledge of them. Hopefully this might lead to the production of a second, more comprehensive, edition before long.

Perhaps it may also give an incentive to all in our Society, so that we may soon be able to produce a similar volume.

PETER W. KING

*The Victorians and their Flowers.* By Nicolette Scourse. Croom Helm, London. 1983. 195 pp. £12.95. ISBN 0 7099 2377 5.

'The love of flowers kindles rapport across the centuries', writes Nicolette Scourse in her preface; 'yet the appeal of flowers is not timeless — a wild rose from the nineteenth century is a different being from that portrayed in the seventeenth century. Each is a mirror of its time.'

Her book itself portrays the nineteenth century from the viewpoint of the twentieth, and some readers may find that this produces occasionally an unfortunate superiority of stance. 'The beguiling old-world flower with its sentiment, mortality, snobbery and controversy disappeared with the Victorian attitudes and preoccupations which created it. Happily, period writings and illustrations can recreate these delightful images . . . and bring to life a lost romantic world.' Alas, not for all of us. The stance can all too easily veer to the patronising, when 'quaint' becomes an adjective of commendation. This is a pot-pourri, suitably enough, in which sentiment and nostalgia are blended with sociology, history and science to form a very colourful mixture, but one which for this reader at least remained a collection of obstinately dead petals.

The dust jacket promises 'a combination of authoritative botanical information and fascinating social history . . . richly illustrated by pictures of Victorian floral extravaganzas and reproductions from contemporary sketch-books.' The chapter headings are certainly varied: Eighteenth-century origins; Mirrors of Victorian Society; Sentiment; Morality; Botanical Fashion; Foreign Exotics; Realities; The Passion for Details; and Scientific Controversy. The subject matter they cover is even more varied, and the style relentlessly bright, with copious quotations from Victorian flower poets accompanied by nostalgic — or patronising — comment, a mixture not perhaps to everyone's taste.

Anyone coming new to Victorian botany and botanists will learn a great deal, and may well be stimulated to go on for themselves to some of the major biographies on which the author has drawn — for example, Mea Allan's *Darwin and his Flowers*. There are plenty of entertaining stories about minor figures, such as the Scottish baker Dick who botanised on the local mountains in every hour he could spare from the bakery, even though that left him with only three hours' sleep a night.

There are all sorts of illustration: a few full-colour reproductions from *Curtis's Botanical Magazine;* a great many black-and-white reproductions from Victorian books and periodicals; and some colour and black-and-white photographs taken by the author of wild flowers in Britain today.

It is a vast canvas, busy with incident. But the publishers have done their author's undoubted originality a grave disservice. Some of the exuberant duplication of stories could with advantage have been pruned. Some of the more superficial references should have been excised, if they could not have been extended.

In the five pages of 'Biographical notes' there are undigested or unnecessary entries — for example, the two reproduced here in full: 'Jekyll, Gertrude, 1843-1932': 'Keats, John, 1795-1821'. And altogether there are far too many careless mistakes — misprints, inexactitudes and mixed-up captions. Even the cover slip accompanying the review copy gets the author's name wrong. One rather jaundiced reviewer need not spoil everyone's enjoyment, however.

The book is available in the Society's Library and will, I hope, give pleasure to many.

ROSALIND HADDEN

# Botanical Records for 1983

by R. M. BURTON*

## Summary

The most interesting records of flowering and other vascular plants made during 1983 in the London Area include some believed to be new plants for their vice-counties.

The relationship is explained between records published in *The London Naturalist* and those in the Society's book *Flora of the London Area*.

## Introduction

The London Natural History Society systematically collects records in a circular area of radius 20 miles, centred on St Paul's Cathedral. Records of flowering plants, ferns, etc. are kept on a card index which has details of all finds which might be of interest, comprising generally a locality, defined as closely as possible, the name of the finder and the date. The most important additions to the records each year, only a small proportion of the total received, are published in *The London Naturalist*. Although 1983 produced more records worth copying on to the card index than any year before, the number sufficiently remarkable to be worth repeating here is similar to those of recent years. Several contributions have been prompted by observation of omissions in the maps which form an integral part of the Society's publication *Flora of the London Area* (Burton, 1983*a*). These maps divide an area approximately the same as the circle mentioned into tetrads, i.e. squares 2 × 2 kilometres in size bounded by lines of the National Grid shown on Ordnance Survey maps, and indicate the distribution of a species by showing in which tetrads it was found during the course of a special survey conducted by the Society. As data collection in this survey formally ended in 1976 it is not surprising that readers have found it possible to update the maps. The tetrads are numbered and these numbers are used again here for ease of cross-referencing. It must be understood, however, that many more records additional to the published maps have been received than those mentioned in this paper, and that many of the finders named have supplied more geographical and other detail than is indicated here.

Records, and in a few cases maps, of casual aliens were included in the *Flora*, so that at least there should be some evidence of the frequency of their occurrence during the period of the survey. Only the most unusual of such species get mentioned here as a rule, but it is worth stating that 1983 produced an exceptionally large number of records of *Digitaria sanguinalis*, in most cases clearly traceable to scattered bird-seed. The two finger-grass specimens I saw myself, collected by J. E. Dews in Falmouth Road, S.E.1 and by J. B. Latham in Stanford Road, W.8, are referable to the closely allied species *D. adscendens* (Kunth) Henrard. Typical *D. sanguinalis* has distinctive rough bristles along the lateral ribs of the exposed outer lemma; these bristles, which can only be seen clearly under about 30× magnification, are lacking in *D. adscendens*. None of the other characters which have been used to separate the two is satisfactorily constant. *D. sanguinalis* has a native range in warm-temperature parts of the Old World. *D. adscendens* is more tropical, but these ranges have been very much obscured by naturalisation. *D. adscendens* would probably be better regarded as a subspecies of *D. sanguinalis*, but a study of other related plants (including *D. ciliaris* (Retz.) Koeler which has I think been wrongly regarded as synonymous with *D. adscendens*) is necessary before any new combination is published. Also I have received four widely scattered records of *Nymphoides peltata*, the fringed

*Sparepenny Cottage, Sparepenny Lane, Eynsford, Kent, DA4 0JJ.

water-lily, from ponds and lakes where it was certainly absent before. It seems that supplies of this most attractive aquatic plant, which is becoming rarer in its native habitats, are becoming a lot cheaper.

## Records

### V.C.16, W. Kent

Pride of place in our Kent records must be given to the work done by Barry Nicholson in the course of a survey commissioned by the London Borough of Greenwich. Though it will be inevitable that he has overlooked some of the Borough's plants, several important discoveries were made, the most unexpected of which is surely the corky-fruited water-dropwort *Oenanthe pimpinelloides*, which has never before been found so near the Thames. This was on private ground near Eltham (47T24) in the company of *Ajuga reptans, Lychnis flos-cuculi, Stellaria alsine* and other species indicating wet conditions. Mr Nicholson also found an *Oenanthe*, probably the same species, in a drier spot near Mottingham 47T02 where there were also *Leontodon hispidus* and *Linum catharticum*. The bristle clubrush *Scirpus setaceus* in Maryon Wilson Park (47T08) was another first-class find. Many localities which one might not have expected to be of interest were covered by his survey, which is how he came to record heath-grass *Sieglingia decumbens* and purging flax *Linum catharticum* in Plumstead Cemetery (47T46) and hare-bells *Campanula rotundifolia* and square St John's wort *Hypericum tetrapterum* on Eltham Warren Golf Course (47T44).

Still in the borough of Greenwich, it was not he but Mrs J. Pitt who found the easily missed lesser chickweed *Stellaria pallida* in grassland adjacent to Oxleas Wood (47T46), nicely demonstrating that the grass is over the thin soil developed on the Blackheath Beds whereas the old woodland nearby is on London Clay. Other contributions from Mrs Pitt are all further south; she did a thorough investigation of Scadbury Park, which evidently has a variety of habitats for plants, for she found there thin-spiked wood-sedge *Carex strigosa*, stemless thistle *Cirsium acaulon*, lily-of-the-valley *Convallaria majalis* and common birdsfoot *Ornithopus perpusillus* (all in 47T40) and adder's tongue *Ophioglossum vulgatum* (47T60). Her hairy buttercup *Ranunculus sardous* on the Ravensbourne Estate, Keston (46T04) is the first in the Kent part of our area away from the tidal estuaries for a very long time, and also the distinctive foliage of fan-leaved water-crowfoot *Ranunculus circinatus* among material dredged from the lake at Chevening (45T86) represents for us quite an extension of range. The water soldier *Stratiotes aloides* which she found in one of the ponds on Chislehurst Common (47T40) is another native aquatic ornamental which must surely have been introduced like the *Nymphoides* in other localities already mentioned, and one which can spread dangerously.

Two of Mrs Pitt's friends also made one excellent record each. Mrs S. Pittman found a new locality for the birdsfoot fenugreek *Trifolium ornithopodioides* near Crockenhill (56T06) and Mrs J. Weightman saw five plants of *Lilium martagon* far from houses in Covert Wood (46T26). In the same general area Mr D. Hicklenton came across a most unexpected population of birdsnest orchid *Neottia nidus-avis* in Crown Wood (46T04) and reported the continued persistence of the Deptford pink *Dianthus armeria* in the colony near Skeet Hill 46T84 which I had wrongly (Burton 1983*a*: 32) implied was extinct.

Mr G. D. Kitchener continued the researches into salt-marsh plants growing by major roads which I mentioned a year ago (Burton 1983*b*), filling in several gaps in the distribution which he had reported. In the central strip of the A2 (67T20 and T22) the slender hare's-ear *Bupleurum tenuissimum* was found to grow in six colonies together numbering many thousands of plants. In the same habitat there was also one very large population of the normally coastal grass *Catapodium marinum*. Other records of his include an uncommon grass *Bromus commutatus*

by a motorway slip-road at Chevening (45T86) and mezereon *Daphne mezereum* hidden in woodland near Pratts Bottom (46T62).

Dr G. S. Joyce showed me specimens of cow-cockle *Vaccaria pyramidata* and other aliens *Ononis baetica* and *Physalis philadelphica* which he had collected in a field at Eynsford (56T26) which earlier in the year had been treated with a thick covering of processed sewage sludge. The processing does not kill seeds which are in the sewage, most of which are of tomatoes; other seeds, like those of *Vaccaria*, *Ononis* and cress *Lepidium sativum* which was present in quantity came from bird cages, while there are also plants the source of whose seeds in sewage is not easily explained. Subsequently this field was visited first by myself and then by J. R. Palmer. The principal additions I was able to make were the rare alien crucifer *Neslio paniculata* and the red garden orache *Atriplex hortensis*. Mr Palmer added *Ononis mitissima, Cuscuta campestris* and a rare alien mayweed *Anthemis altissima*. Many of Mr Palmer's other 1983 finds have already been reported in *B.S.B.I. News* and space does not allow the repetition of all of them, but I cannot pass over his discovery of a small group of plants of the American bur-marigold species *Bidens connata* on the drift-line of the Thames east of Crossness (48T80). This is an extremely interesting extension of the known range of this plant which I showed is well naturalised by the canals in the system which runs into the Thames at Brentford (Burton 1979). *(Angelica archangelica* is well naturalised around Brentford and in the last few years plants from its water-borne seed have become a fairly frequent sight on the drift-line below London in Kent).

## V.C. 17, Surrey

Our most remarkable records from Surrey this year are certainly those contributed by Dr A. C. Leslie, who is preparing a supplement to Lousley's flora of the county (1976). The sterile form of *Poa bulbosa*, already known to occur on the Thames-side path at Hampton Court, has now been recognised on the Surrey side of the river also, ranging from Hurst Park (16T48) up to Sunbury Lock (16T08). Further down river he saw the sea-aster *Aster tripolium* above Hammersmith Bridge (27T28). In Ashtead Park he found *Typha* × *glauca* with its parents. Most exciting of all, he was in the party which established the fact that the autumn squill *Scilla autumnalis* is still present at the site which used to be called Moulsey Hurst (16T48), together with Smith's cress *Lepidium heterophyllum* and sheepsbit *Jasione montana*, where they had previously been feared destroyed by building works (Lousley 1976: 348). The Thames continues to produce worthwhile plants for others. Miss J. M. Stoddart found the soft shield-fern *Polystichum setiferum* growing out of vertical stonework by the Putney Embankment (27T26), and I had the privilege of joining a small party which gained access to Brentford Aits (17T86). These are heavily shaded by planted trees but the upper Ait has a population of yellow loosestrife *Lysimachia vulgaris* and a certainly self-sown but already fertile plane tree *Platanus hybrida*.

The Thames path also produced R. B. Hastings's best Surrey plant of the year, very convincing material of *Rumex* × *dufftii* Hausskn., the hybrid of two common dock species, *R. obtusifolius* and *R. sanguineus;* this was outside Kew Gardens in 17T66. Down-river Mr Hastings found single plants of the marsh dock *R. palustris* at the water's edge in Barn Elms Reservoir (27T66) and on the Thames wall by Battersea Park (27T66), a locality which also produced the skull-cap *Scutellaria galericulata*, zigzag clover *Trifolium medium* and one plant of the orange balsam *Impatiens capensis*. On a roadside wall in Battersea (27T86) he was surprised to see a single small crown of the maidenhair spleenwort *Asplenium trichomanes*. He reports that pigweed *Amaranthus retroflexus* and thorn-apple *Datura stramonium* appeared in many disturbed places in Kew Gardens (17T86) in 1983. One such place was a fairly recently cleared plot near the herbarium building, where he and Dr T. A. Cope produced a long list of plants, many of them

evidently having their origin in the gardens, such as love-in-a-mist *Nigella damascena* and the malvaceous *Urocarpidium peruvianum.*

Still by the Thames, J. N. B. Milton, whose name will be mentioned again under other counties, found the rare persicaria species *Polygonum mite* east of Kew Bridge (17T86). An even more noteworthy find of his was the rare grass weed *Bromus secalinus* growing in barley at Chipstead (25T66). A more obviously alien *Bromus* species is *B. unioloides* which Miss O. Maunder found in the middle of Sutton (26T44). I am also grateful to Miss Maunder for the news that there are three plants of the man orchid *Aceras anthropophorum* surviving on Banstead Downs west of the railway (26T40).

J. E. Harvey wrote to me to point out that the *Sorbus torminalis* mentioned in the *Flora* as growing on Wandsworth Common (Burton 1983*a*: 74) is in fact *S. latifolia;* although the mature trees are obviously planted there are also suckers and some small seedlings. A more unusual record from Mr Harvey is of a seedling Indian bean tree *Catalpa bignonioides* in the grounds of King's College Hospital (37T26). Another self-sown ornamental is the *Sorbaria tomentosa* growing out of the wall of Richmond Park (17T80), reported by B. R. Radcliffe, who also found deadly nightshade *Atropa belladonna* in two places in the Kingston area (17T80 and 27T00), neither of them the same as where V. F. Hancock saw three good clumps near the wall of Richmond Park. Mr Kitchener's exploration of motorway junctions produced *Puccinellia distans,* a salt-marsh grass species, at Reigate Hill (25T42), Merstham (25T84) and Godstone (35T42). Mrs P. Dawe told me about *Utricularia vulgaris* flowering well in the Great Pond, Epsom Common (16T80) which was re-created only a few years ago; this bladderwort was previously known from a pond on the far side of this large common and it would be interesting to discover whether it was transferred accidentally or deliberately from one to the other.

## V.C. 18, S. Essex

Mr Milton discovered the most unexpected of all the year's aquatic aliens, the water-lettuce *Pistia stratiotes,* covering much of a pond at Upper Walthamstow (38T88), though there was also room for three species of duckweed. *Pistia* is a free-floating plant which makes concave rosettes of leaves two or three inches across. It can make new plants by budding in the manner of duckweeds, and in tropical waters sometimes does so to the point of becoming a pest. Although it flourishes in the *Victoria amazonica* house at Kew it is normally considered tender and not suitable for growing outdoors in our climate; however it seeems to have been able to increase well in the hot summer of 1983. Mr Milton also explored the old canals near Stratford (38T82) to good effect, finding sea club-rush *Scirpus maritimus* and a few plants of the handsome greater spearwort *Ranunculus lingua* in a place where it is hardly possible to suppose that it can have been deliberately introduced. Before you rush off to find it there for yourself, I should warn you that this stretch of water was filled in during the following winter. His numerous other records from this vice-county include galingale *Cyperus longus* from Oak Hill ponds near Hale End (39T80).

Still near Stratford, Dr K. J. Adams showed me an interesting list from Mill Meads (38T82), including sweet flag *Acorus calamus,* meadow cranesbill *Geranium pratense* and the smooth tare *Vicia tetrasperma.* In and near the Mar Dyke at Aveley (57T68) he found an uncommon water-starwort *Callitriche obtusangula,* the stemless thistle *Cirsium acaulon,* viper's bugloss *Echium vulgare* and knotted bur-parsley *Torilis nodosa,* to mention only the most interesting in a surprising assortment of plants. Dr Adams's best find of the year was perhaps *Carex strigosa* at the head of a stream near the main road through Epping Forest (49T06?); this species has not been recorded before from the Forest although there are numerous suitable habitats. An even rarer sedge is the tufted sedge *C. elata,* found by T. Pyner in Harts Wood (69T02) and expertly confirmed by A. C.

Jermy. Another Epping Forest plant which has had to wait surprisingly long for discovery is the marsh violet *Viola palustris*, found by a party from the Conservation Centre. It is extraordinary that the strong colony should be in a place where it must have been overlooked by botanists of many generations (including myself).

Mr Kitchener's investigation of main roads took him to the Brentwood by-pass (59T62) where the only halophytes he found were the seemingly inevitable *Puccinellia distans* and the buckshorn plantain *Plantago coronopus*, which presumably has a similar origin here. Near the tideway in a disused sludge lagoon on Rainham Marsh (58T20), a locality better known for its birds than its vegetation, Mr Hastings found one plant of velvet-leaf *Abutilon theophrasti* and five of sunflower *Helianthus annuus*.

## V.C. 19, N. Essex

I joined Dr Adams for a morning's investigation of the aquatic flora of the arms of the River Lea north of Waltham Abbey (30T80), which have an excellent selection of emergent and riparian species. In a corner of the moat in the Abbey Gardens we found what appears to be a population of the alien duckweed *Lemna minuscula* which he had found once before in this part of our area (Leslie & Walters 1983). Apparently new to V.C. 19 are the two alien docks *Rumex cristatus* and *R. patientia* which were together on the side of the new road nearby. Dr Adams found the glaucous club-rush *Scirpus tabernaemontani* in one of the derelict Abbey fish-ponds. On a different occasion he found the round-leaved fluellen *Kickxia spuria* and the loose silky-bent *Apera spica-venti* as field weeds at Eppingbury Farm (40T42). The fluellen was also seen in Harlow New Town (40T48) by Mrs. A. M. Boucher.

## V.C. 20, Hertfordshire

In Herts Mrs Boucher found another large population of red-flowered early march orchid *Dactylorchis incarnata* near Cheshunt (30T62) and in Bencroft Wood (30T26) four large patches of lily-of-the-valley *Convallaria majalis*, well away from the road making their status less obvious than that of the Welsh poppy *Meconopsis cambrica* which was certainly derived from garden rubbish. The most interesting of her other records are perhaps the odd aliens from Rye Meads Sewage Farm (31T80), such as sesame *Sesamum indicum*, a dodder *Cuscuta campestris* and *Amaranthus hybridus*. Again near Cheshunt I went to examine the population of the river water-dropwort *Oenanthe fluviatilis* which I reported here three years ago (Burton 1981: 90), only to find that it had recently fallen victim to the Thames Water Authority's mania for re-shaping the banks of ditches.

## V.C. 21, Middlesex

Its congener the hemlock water-dropwort *O. crocata* appears twice in the year's major Middlesex records, if I can be allowed to exaggerate the significance of the two plants I saw in a most unlikely situation against a car-park fence near Red Lion Street (38T00). It was more obviously important in the list of plants from the Gunnersbury Triangle railway site (17T88) which was the object of a public inquiry in the early summer. The impressive list of species, including hemp agrimony *Eupatorium cannabinum*, narrow buckler-fern *Dryopteris carthusiana* and many other species uncommon so close to the centre of London, carefully checked and presented by members of the Chiswick Wildlife Group, was certainly one of the factors which induced the inspector to rule against the industrial development of the Triangle.

Several recorders already mentioned under other counties also contributed Middlesex records. Mr Milton did best with a population of London rocket *Sisymbrium irio* larger than the two other established ones, at the Tower of London and in Regent's Park, put together. This was as a weed at Mile End

(38T62). Other weeds there were abundant celery-leaved crowfoot *Ranunculus sceleratus* and two plants of the very seldom seen alien grass *Koeleria phleoides* in flower beds at Queen Mary College. Mr Radcliffe found self-sown *Cotoneaster bullatus* on a wall top in Twickenham (17T64). Mr Hastings saw a marrow plant *Cucurbita pepo* growing out of the inner wall of Staines Reservoir (07T42) just above water level and a tall fig tree *Ficus carica* on the causeway of Queen Mary Reservoir (06T68), further evidence of the occasional potential of sites visited mainly by bird-watchers. At the King George VI Reservoir (07T42) A. V. Moon found spotted medick *Medicago arabica* and a large patch of grass vetchling *Lathyrus nissolia*. Dr Leslie collected the same hybrid *Typha* as in Surrey from a large patch found with the two reed-mace species in the course of our field meeting on 6 August to Brent Reservoir (28T06). This hybrid cannot be separated from *T. angustifolia* for certain except by technical details of the pistillate flowers forming the lower part of the inflorescence (Tompkins and Taylor 1983), so it may be overlooked. Another of our meetings, on 14 May, made the unexpected discovery of the mouse plant *Arisarum proboscideum* on Harrow Weald Common (19T42). This rare native of Tuscany was introduced long ago to gardens as a curiosity; the leaves are very like those of lords and ladies *Arum maculatum* to which it is related, but the spadix is produced into a long brown tail suggesting the back of a mouse scuttling into the spathe. The size of the patch discovered suggests that it has been slowly increasing from a single tuber planted on the common some decades ago, when it was already becoming wooded. The same meeting found abundant blinks *Montia fontana* subsp. *chondrosperma* on Whitchurch Common (19T60).

J. B. Latham's discovery of *Thymus drucei* in Kensal Green Cemetery (28T22) is mentioned elsewhere in this issue (p. 60). It is the first certain record of the common wild thyme in Middlesex, but unfortunately is certainly introduced in this locality, unlike the pepper saxifrage *Silaum silaus* which is the most important of the year's additions to his list of native plants for the cemetery. Another first for the county, though only an escape from cultivation, is the white-flowered bellflower *Campanula alliarifolia,* found by Miss D. Thompson by a street in Harrow Weald (19T40). At the other extreme, a single plant of the early purple orchid *Orchis mascula* which had been thought extinct in Middlesex was found in a wood [17T**] by P. J. Edwards. Penny-royal *Mentha pulegium* is genuinely extinct as a native plant in the London area generally, its discovery by K. E. Bull in the car park at Syon Park (17T66) undoubtedly being connected in some way with the plant's availability as material for the herb garden on sale nearby. Another oddity found there by Mr. Bull was a plant of the winter cherry *Solanum capsicastrum* on cobble stones. I am indebted to D. H. Kent for the information about Mr Bull's and Mr Edwards's finds; Mr Kent himself saw a small group of the shining cranesbill *Geranium lucidum* by a road on Uxbridge Common (08T84). E. J. Clement reported to me the discovery by J. K. Jackson of *Allium paradoxum* well established along Grim's Dyke in Saddler's Mead Recreation Ground (19T20). Another increasing alien is the Californian brome *Bromus carinatus* which Mrs E. Norman told me has now reached Holland Park (27T48). She also saw the non-invasive alien grass harestail *Lagurus ovatus* adorning the base of a lamp standard and near St Paul's Cathedral (38T20?).

## V.C. 24, Buckinghamshire

The small part of Bucks. in our area (divided between that county and Berks. by the modern boundaries) had a new plant for the county found in Wraysbury gravel pit (07T02) by C. J. Hazell and R. B. Hastings. This is the pickerelweed *Pontederia cordata,* a blue-flowered aquatic plant from North America, which has been observed a few times before as a persistent escape from cultivation in Britain, though it is not clear how it escapes. Nearby on dry ground they found the blue fleabane *Erigeron acer,* not previously noticed in this part of our area, and the marsh dock *Rumex palustris*. Mr Hastings with P. Naylor and A. V. Moon saw

large clumps of *Oenanthe fluviatilis*, a species mentioned above under Herts, in the Coln Brook near Iver (08T40) which obviously needs protection. In Black Park (08T02?) R. A. Boniface and E. C. Wallace found abundant floating club-rush *Scirpus fluitans*, as well as the bristle club-rush *S. setaceus* and one plant of royal fern *Osmunda regalis*.

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# Obituaries

## ASHLEY GEORGE GYTON THOMPSON, M.A., M.D., D.P.H., 1890-1983

Dr A. G. G. Thompson was born on the 23 January 1890 at Hipperholme near Halifax in Yorkshire. He died on the 23 December 1983, just one month short of his ninety-fourth birthday.

With his four brothers, Ashley attended Collyer's School — later to become Horsham Grammer School — of which his father, the Rev. Dr G. A. Thompson was Headmaster from 1893 to 1917. In 1908 he went to Cambridge with an Exhibition at Pembroke College. His sport was rowing and he competed for his College and in the University Trial Eights. He read the Natural Sciences Tripos as his parents had chosen a medical career for him.

Throughout The Great War he served in the R.A.M.C. with the 3rd Cavalry Division in France, first on horseback and later mounted on a motorcycle. After the war he was posted to Cologne in the army of occupation where he became responsible for health and hygiene. Civilian work being scarce, he remained in the R.A.M.C. and in 1921 he was sent to the Rawalpindi District of the Punjab, India, where with the rank of major he was for two years Deputy Assistant Director of Medical Services. His work on malarial prophylaxis provided the basis for his dissertation for the degree of M.D. (Cantab.) which he took in 1924.

On return to England he was successively Assistant Medical Officer for the ports of Southampton and Liverpool, before becoming Deputy Medical Officer of Health for Ilford, then from 1927 until his retirement in 1955, Medical Officer of Health for Lambeth. The clinic for diphtheria immunization which he opened was the first in London.

When the Second World War began in 1939 Dr Thompson was still in the Army Reserve of Officers, but it was realized that one of London's most densely populated boroughs needed his services more than did the R.A.M.C. He was responsible for organizing Lambeth's casualty services, which he supervised throughout the Blitz, encouraging the first aid staff and ambulance drivers by turning out to every major incident in the Borough. His own family house was destroyed by a flying-bomb in 1944. After the war peace came to Lambeth and the bomb-devastated Embankment became the site of the 1951 Festival of Britain. Dr Thompson saw the inception of the National Health Service and the re-organization of Public Health Services. He took great interest at this time in the Central Council for District Nursing on which he served first as Executive

Secretary and later as Vice-President. However, in 1955 it was with satisfaction that he was able to retire from Lambeth to learn new skills, cooking and tapestry, and to travel and to pursue in particular his hobby of birdwatching.

At heart Ashley was a countryman. In boyhood days he had been a keen egg collector. At Horsham he had a tame herring gull, whose broken wing he had set. He also kept ferrets, selling rabbits to his mother and to the local butcher. He it was in School House who milked the cow when the cowman failed to turn up. He was regularly sent by his father to the market where the Reverend Headmaster did not wish to be seen!

Dr Thompson joined the L.N.H.S. in 1947 and was a very familiar figure at our indoor and field meetings. Throughout his very active birdwatching life he covered an enormous amount of ground, and until he was well into his eighties he was still travelling widely. On one such occasion he spent part of a holiday on the Isles of Scilly and then departed for Fair Isle to complete the holiday. His tall, sunburnt, upright figure and long cleft stick were very familiar sights as he crossed the dunes and marshes or visited the reservoirs. 'Tommy' was a very popular person who willingly assisted the inexperienced birdwatcher. His enthusiasm when watching birds at Beddington Sewage Farm was just as great as when he was on Fair Isle and he sent a good many records from there to the *London Bird Report*. Whenever he came to Bookham Common he assisted in the investigation of feeding sites of birds in the oakwood and in the bird counts.

It is recalled how on a trip to Scandinavia he caught a Tengmalm's owl in dense woodland by sticking out his hand as it flew past.

In 1981 'Tommy' moved to Cambridge to live with his daughter Jean. When he passed his ninetieth birthday he found the recent restrictions of being bedridden with much physical pain and the isolation of deafness most tiresome, especially as he had to give up driving his car. His wife Muriel predeceased him by four years after sixty-four years of happy marriage, but he leaves a son, Professor John Cloudsley-Thompson (a member of the L.N.H.S. since 1950) and three daughters, Joan Hacon, Jean Harvey and Jill Kyle, to whom we offer our very deepest sympathy.

K. H. Hyatt

## GURTH WALLER, 1909-1984

Gurth Waller, who died on 2 April 1984, was born at Beckenham, Kent, on the 25 August 1909, the youngest son of Edith and John Waller. He attended Beckenham Grammar School for Boys and The Mercers' School. In 1930 he qualified as a chartered surveyor and in 1937 he joined the Valuation Office. He retired as District Valuer for Portsmouth in 1974.

From an early age he had been interested in natural history. He joined the L.N.H.S. in 1927 whilst still living at Beckenham. His main interest was entomology, although he was also interested in ornithology and ecology. Over the years he amassed a good representative collection of British Diptera, particularly of the families Chironomidae, Dolichopodidae, Empididae, Muscidae and Syrphidae. In 1976 he moved to Hythe in Kent, from where he contributed local records to the Kent Biological Archives at Maidstone Museum, to whom he bequeathed his collection which is contained in forty-one store-boxes — every specimen bearing a data label.

Although a quiet and possibly shy person, Gurth Waller was a friendly companion whose great knowledge of Diptera, both in the field and at the bench, were always most willingly shared. He never pushed or tried to assert himself in the hierarchy of dipterists, but was quite content to enjoy the pleasure of the study of flies. He wrote very little, although in the late 1940s he published two early records for this country of *Volucella zonaria*, an immigrant hover-fly.

Gurth Waller left his entomological books and journals to the L.N.H.S. To his wife Gwen and to his children Gill, Duncan and Judy, we extend our deepest sympathy.

E. G. PHILP

## WILFRED DURANT MELLUISH, 1899 – 1983

Wilfred Durant Melluish was born on 20 August 1899 in North-West London and died on 30 May 1983. He was educated at Lindisfarne College, Westcliff-on-Sea and in 1916 went to Imperial College, London to study geology and botany. However, in 1917 he volunteered for the Royal Flying Corps and duly qualified as a pilot. After The Great War he settled in the family business as a manufacturing confectioner (Butter Creams Ltd.) until the Second World War when he rejoined the Royal Air Force, but a back injury resulting from boxing in his school days made him unfit to serve as a pilot. He became adjutant to a Polish squadron No. 305 and then moved to Flying Control in Fighter Command. He left the R.A.F. as a Flight Lieutenant.

Early in life he became interested in natural history and he even painted some birds at the age of ten. During the Second World War, when stationed in the West Country, he was able to watch birds in his off-duty hours and he also took a great delight in the marine fauna of the Cornish coast. In 1935 he joined the L.N.H.S. and undertook the survey of Hendon Park Farm, giving the Society a talk on the results in July 1939. In post-war years he took on the organisation of the ten-year census of great crested grebes, and wrote a series of papers on the results in the *London Bird Reports* for 1950, 1951, 1952, 1953 and 1954, and in 1956 he gave a final report and summary of results. He also organised and wrote up (with K. P. Keywood) a very detailed study of the bird population of four gravel pits, taking on himself that of Moor Hill (1952). Then (with H. F. Greenfield) he wrote the chapter on Agricultural Land in *The Birds of the London Area since 1900* (ed. R. C. Homes, 1957 and 1964). He was a member of L.N.H.S. Council from 1948 to 1957, secretary of the Ornithology Section from 1946 to 1949 and a committee member 1950, Programme Secretary of the Ecology Section from 1960 to 1961 and a committee member from 1963 to 1964. He was also a member of the B.O.U., B.T.O., R.S.P.B., B.E.N.A. and R.S.N.C.

When he moved from Mill Hill and settled in Leatherhead he devoted his energy to the Survey of Bookham Common, especially the birds of the plains until within about four months of his death. In addition to several notes on the birds there, he wrote two important papers on the bird population of grassland with encroaching scrub in which he gives much information on the numbers of birds in summer and winter, and the population changes that take place as the scrub thickens (*The London Naturalist* for 1960 and 1969).

Wilfred was a modest and kindly person who was greatly appreciated by all who knew him. A charming man, who was a great companion and who showed a quite extraordinary gentlemanly courtesy and consideration towards everyone, his manners were of a generation that is past. His wife, Margaret, died in 1974 and he then lived by himself, keeping the house neat and serving his meals with everything just so, not the usual bachelor mess. Stewart, his son, thought it was his monthly visits to Bookham and the contact he had with naturalists there that sustained him in the loneliness of those years and, far more than the love of his house and garden, made him reluctant to move away from Leatherhead.

He wrote well, as is shown in his ornithological papers, which were produced in important detail for both the habitat and the birds, with thorough and factual summaries. He was very enthusiastic and knowledgeable about music and he and Margaret used to play together on two pianos every evening. He also composed music for at least fifty years, although none was ever published. He kept in touch

with topical matters of the moment and was keen on following cricket and tennis up to the last. Our sincere sympathy is offered to Stewart and his wife and their two daughters.

The writer is grateful to all those who have supplied information, especially C. B. Ashby, O. B. J. French, Ella M. Hillman, D. Lilliman, R. A. S. Melluish, Joan Stoddart, W. G. Teagle and Prof E. H. Warmington.

GEOFFREY BEVEN

## LESLIE BAKER, 1911 – 1983

Leslie Baker was born in Durban, South Africa, of British parents. He came to England in 1921 to go to Mill Hill School and in 1928 he moved to the Chelsea Art School, where he met his future wife, Marjorie. He then worked with considerable success as an artist in various advertising agencies, finally becoming a director of Pembertons Ltd, from which he retired in 1969.

Leslie was a keen amateur birdwatcher from an early age and living most of his life in south-west London soon joined the London Natural History Society. He became a member of its Ornithological Committee and later its Chairman. From 1949 to 1951 he took a major part with other members of the section, John Parrinder, Barney Richards, Bunny Teagle and Stanley Cramp in the London Starling Enquiry. For three years this team, helped by others, caught and ringed over 3,000 starlings at their roosts in Central London. This involved capturing the roosting birds on their ledges in the Trafalgar Square area – with some major acrobatic feats, especially by Barney Richards – which were later ringed and colour sketches of the birds made by Leslie. It also included long series of counts of the roosting birds on the trees in Duck Island in summer and on buildings in winter. The results conclusively disproved two ancient beliefs – that most of the roosting starlings were visitors from abroad and that numbers were well in excess of 100,000; they were published in a chapter of the Society's book *The Birds of the London Area since 1900,* edited by R. C. Homes (1957, 1964).

Leslie then became seriously interested in the work of the British Trust for Ornithology. He served on its Council and worked on one of its major committees, the Publicity Committee, where his knowledge of advertising and layout were of inestimable value. He also served on the Council of the Royal Society for the Protection of Birds. His ornithological interests were mainly confined to the London area, where he served for a number of years as the Official Observer for Kew Gardens and he made many trips with his old friend Barney Richards, especially their annual spring visits to Bookham Common to study the dawn chorus. He made a few visits abroad and was particularly attracted to Cyprus.

In 1981 Leslie was made an Honorary Vice-President of the L.N.H.S. He was an immensely attractive man, wise, friendly and gentle with many ornithological friends in London and elsewhere. He was an excellent bird painter and continued to work on avian portraits and landscapes after his retirement. He was also a most skilful cartoonist; many of his cartoons were published, whilst others, sent as Christmas cards, were treasured by his many friends. His death will leave a sad gap in their lives and in the British Trust for Ornithology. He leaves his wife Marjorie and their son, Nick, to whom our deepest sympathies are extended. The L.N.H.S., the B.T.O. and the R.S.P.B. were represented at Leslie's funeral at Mortlake Crematorium on 6 September 1983.

STANLEY CRAMP

# London Natural History Society Statement of Affairs at 31 October 1983

| 1982 | | | | |
|---|---|---|---|---|
| | **General Fund** (incorporating the Hindson and Castell Bequests) | | | |
| 87,825 | Balance at 1 November 1982 | | | 96,163 |
| 59 | *Add:* Investment deposit interest | 70 | | |
| 1,443 | National Savings Bank interest | 1,446 | | |
| 5,531 | Investment income received | 6,110 | | |
| 3,397 | Income Tax recovered (including £1,164 from previous year) | 2,465 | | |
| 3,536 | Profits less losses on sales of investments | 1,659 | | |
| — | Legacy (Estate of the late H. W. Payton) | 1,955 | | |
| 13,966 | | 13,741 | | |
| (1,225) | *Less:* Custodian's charges | (1,575) | | |
| 12,741 | | | | 12,166 |
| 100,566 | | | | 108,329 |
| (4,403) | *Less:* Deficit on General Account for year | | | (9,928) |
| 96,163 | | | | 98,401 |
| | **Other Funds** | | | |
| | Library Cataloguing Fund | | | |
| 99 | Balance at 1 November 1982 | 99 | | |
| | Plant Mapping Scheme: Research and Publication Fund | | | |
| 212 | Balance at 1 November 1982 | 212 | | |
| 311 | | | | 311 |
| 96,474 | | | | 98,712 |
| | **Current Liabilities** | | | |
| — | *Flora of the London Area* provision | 11,400 | | |
| 2,300 | *London Naturalist* provision | 3,500 | | |
| 2,200 | *London Bird Report* provision | 3,000 | | |
| 400 | *Programme* provision | — | | |
| — | Contribution to proposed tern raft | 75 | | |
| 4,900 | | | | 17,975 |
| £101,374 | | | | £116,687 |

| 1982 | | | |
|---|---|---|---|
| | **Assets** | | |
| | **Quoted investments** at cost | | |
| 86,890 | (Market value £175,446) | | 92,361 |
| | **Funds at bank and on deposit** | | |
| | National Westminster Bank plc | | |
| 754 | Current account | 938 | |
| 750 | Deposit account | 15,302 | |
| 143 | Investment cash | 971 | |
| 12,806 | National Savings Bank account | 7,102 | |
| 14,453 | | | 24,313 |
| 31 | **Cash in Hand** | | 13 |
| £101,374 | | | £116,687 |

K. F. BETTON, J. H. SAND } Council Members

**Report of the Auditors to the Members of the London Natural History Society**

We have audited the financial statements, comprising the above Statement of Affairs and attached receipts and payments account, in accordance with approved auditing standards.

In our opinion these statements give a true and fair view of the receipts and payments of the Society for the year ended 31 October 1983 and of its assets, current liabilities and fund balances at that date.

4 London Wall Buildings,
LONDON EC2M 5NT
2 December 1983

FRASER KEEN
Chartered Accountants

# General Account for the year ended 31 October 1983

| 1982 | | | | 1982 | | | |
|---|---|---|---|---|---|---|---|
| | **Payments** | | | | **Receipts** | | |
| 1,153 | Hire of halls, etc | | 418 | 5,825 | Subscriptions – current | 5,988 | |
| | Lecturers' fees and expenses, Sectional | | | 6 | arrears | — | |
| 532 | expenses | | 530 | 121 | in advance | — | |
| 8 | Castell Research Centre | | 1 | 61 | entrance fees | 68 | |
| 381 | Library | | 445 | 6,013 | | | 6,056 |
| 143 | Equipment repairs and renewals | | 1,144 | 247 | Donations | | 208 |
| 481 | *Bulletin* and *Newsletter* expenses | | 376 | 257 | Tax recovered from deeds of covenant | | 307 |
| 368 | *Programme* printing costs | | 677 | 191 | Deposit Account interest | | 149 |
| | Provisions — | | | 52 | Sale of surplus library stock | | — |
| | *Flora of the London Area* printing costs — | | | | *London Naturalist* **61** | | |
| — | not adjusted for closing stock) | 11,400 | | 2,900 | Provision 1982 | 2,300 | |
| 2,300 | *London Naturalist* **62** | 3,500 | | (3,508) | Printing and expenses | (2,871) | |
| 2,200 | *London Bird Report* **47** | 3,000 | | (608) | | (571) | |
| 400 | *Programme* | — | | 34 | Sale of offprints | — | |
| 4,900 | | | 17,900 | (574) | | | (571) |
| | Mailing costs (*L.N.* **61**, | | | | *London Bird Report* **46** | | |
| | *L.B.R.* **46**, *Programmes*, | | | 2,900 | Provision 1982 | 2,200 | |
| | *Bulletins* and *Newsletters* – *including* | | | (2,907) | Printing and expenses | (2,183) | |
| 1,466 | postage, envelopes, etc.) | | 1,152 | (7) | | | 17 |
| | Costs of services (Auditor's fees, | | | 435 | Sales of journals | 594 | |
| 393 | insurance, etc.) | | 500 | (84) | Expenses | (82) | |
| 625 | Honoraria | | 625 | 351 | | | 512 |
| 88 | Miscellaneous postage and telephone | | 134 | 43 | Subscriptions to *Bulletin* | | 29 |
| 26 | Miscellaneous stationery | | 408 | | *Flora of the London Area* | | |
| 530 | Contributions to other organisations | | 515 | — | Sales | | 10,278 |
| | | | | — | Cash expenses | | (2,140) |
| | | | | — | | | 8,138 |
| | | | | | *Atlas of Breeding Birds* | | |
| | | | | | *of the London Area* | | |
| | | | | — | Sales | 35 | |
| | | | | 118 | Royalties | 17 | |
| | | | | 118 | | | 52 |
| | | | | 4,403 | Excess of payments over receipts (transferred to General Fund) | | 9,928 |
| £11,094 | | | £24,825 | £11,094 | | | £24,825 |

# The London Naturalist

## Instructions to contributors

**Submission of papers**

Papers relevant to the natural history and archaeology of the London Area should be submitted to the editor, Mr K. H. Hyatt, Department of Zoology, British Museum (Natural History), Cromwell Road, London SW7 5BD, before the end of January if they are to be considered for publication in the same year. They should be typed, with double spacing and wide (three cm) margins, on one side of the paper. Authors must retain a duplicate copy. Papers should include at the beginning an abstract, summary, or synopsis.

**Text**

Locality spellings should follow the latest editions of the maps published by the Ordnance Survey. Capitalization should be kept to a minimum. Common names of animals and plants must begin with lower-case initials, and scientific names must be underlined. When both common and Latin names are given there should be no brackets or commas separating them. Genus names should appear in full where first used within each paragraph. When scientific names are taken from a standard work, which must be cited, authorities should be omitted. In descriptive matter numbers under 10 should be in words, except in a strictly numerical context. Dates should follow the logical sequence of day, month, year (i.e. 25 December 1971). Measurements should be in metric and follow the SI system (Système International d'Unités), with imperial equivalents in parentheses where appropriate. There should be no full point following Dr, Mr, Mrs or St. Lists should be in natural, alphabetical or numerical order.

**References**

Reference citation should be based on the Madison rules (in *Bull. Torrey bot. Club* **22:** 130-132 (1895)), except that a colon should always precede a page number. Capitalization in titles of papers in journals should be kept to a minimum. Journal titles should follow the abbreviations in the *World of Scientific Periodicals* and be underlined. Examples are as follows:

In text:

Meadows (1970 : 80) or (Meadows 1970).

In references:

MEADOWS, B. S. 1970. Observations on the return of fishes to a polluted tributary of the River Thames 1964-9. *Lond. Nat.* **49:** 76-81.

MELLANBY, K. 1970 *Pesticides and Pollution.* Ed. 2. Collins, London.

WHITE, K. G. 1959. Dimsdale Hall moat, part II. *Trans. a. Rep. N. Staffs. Fld Club* **92:** 39-45.

**Illustrations**

Distribution maps should be submitted in the form of a Recording Map with symbols in Indian ink or Letraset. Solid dots are used to indicate contemporary or recent presence, circles for old records and crosses (not pluses) for other information, such as introduced species. Tetrad dots and circles should be 4.0 mm and tetrad crosses 5.0 mm, with a line thickness of 0.8 mm; all monad symbols should be 1.6 mm with a line thickness 0.5 mm. The caption should be written outside the frame of the map and will be set up by the printer. The Mapping Schemes Secretary can provide Recording Maps, advice and dies for printing distribution symbols.

Line drawings should be in Indian ink on white card, larger than the printed size. Place names, etc., must be produced with stencils or Letraset. Captions should be separate as they will be set up by the printer.

Photographs should be glossy black-and-white prints, of good contrast, preferably half-plate in size.

**Proofs**

Proofs will be sent to authors for scrutiny, but only essential corrections can be made at that stage.

**Reprints**

**Up to 25 free reprints will be supplied on request.** Additional copies may be purchased if ordered when the proofs are returned.

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